

Flammenausbreitung bei Rohrleitungen
und Dämmstoffen für Rohrleitungen
Teil II/4

T 2332/5

T 2332/5

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Abschlußbericht Teil II/4 - Versuchsergebnisse

Nr. 23-80.01-287

**Flammenausbreitung bei Rohrleitungen und Dämmstoffen
für Rohrleitungen**

- Untersuchungen über die Abhängigkeit der Versuchsergebnisse von einzelnen Versuchsrandbedingungen
- Untersuchungen an einer Reihe von handelsüblichen Dämmstoffen und Abwasserrohren

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Versuch Nr. : 39.1+

Materialbeschreibung

Material Nr. 6.1 : Weichschaum auf synthetischer
Kautschukbasis

Abmessungen

Innendurchmesser/Außendurchmesser: 20 mm/ 60 mm
Wanddicke : 20 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 2 am 17.10.1986

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|--|
| 0' | Zündung der Holzkrippe (2kg) durch zwei mit 10ml Petroleum getränkte Weichfaserdämmstreifen. |
| 0' 30'' | Mäßige Rauchentwicklung. |
| 1' | Oberfläche der horizontalen Schenkel beginnt zu sintern und das Material bläht sich auf. |
| 2' 15'' | Material am horizontalen Schenkel bricht auf. Flammen schlagen hinter die Rohre. |
| 2' 50'' | Oberfläche der vertikalen Schenkel beginnt zu sintern. |
| 3' 30'' | Material an vertikalen Schenkeln bricht auf. |
| 5' | Material krempelt sich im Bereich der Biegestelle auf. |
| 7' | Material schrumpft an den vertikalen Schenkeln. |
| 9' | Flammen nur noch innerhalb der Holzkrippe. |
| 20' | Versuchsende. |

Beobachtungen nach dem Versuch von 20 Minuten Dauer

Unzerstörte Restlänge:

Probe 1(links): 0 m
Probe 2: 0 m
Probe 3: 0 m
Probe 4: 0 m

Brandversuch 39.1 am 17.10.1986

| Zeit nach Versuchsbeginn (min) | Druck (Pa) | Zuluftmenge (m ³ /min) |
|--------------------------------------|---------------|--------------------------------------|
| 0. | -10 | 6,041 |
| 2. | -6 | 6,214 |
| 3. | -7 | 6,041 |
| 4. | -5 | 6,214 |
| 5. | -5 | 6,0 |
| 6. | -4 | 6,041 |
| 7. | -4 | 6,041 |
| 8. | -6 | 6,041 |
| 10. | -7 | 6,041 |
| 15. | -8 | 5,868 |
| 17. | -9 | 6,041 |
| 20. | -9,5 | 6,041 |

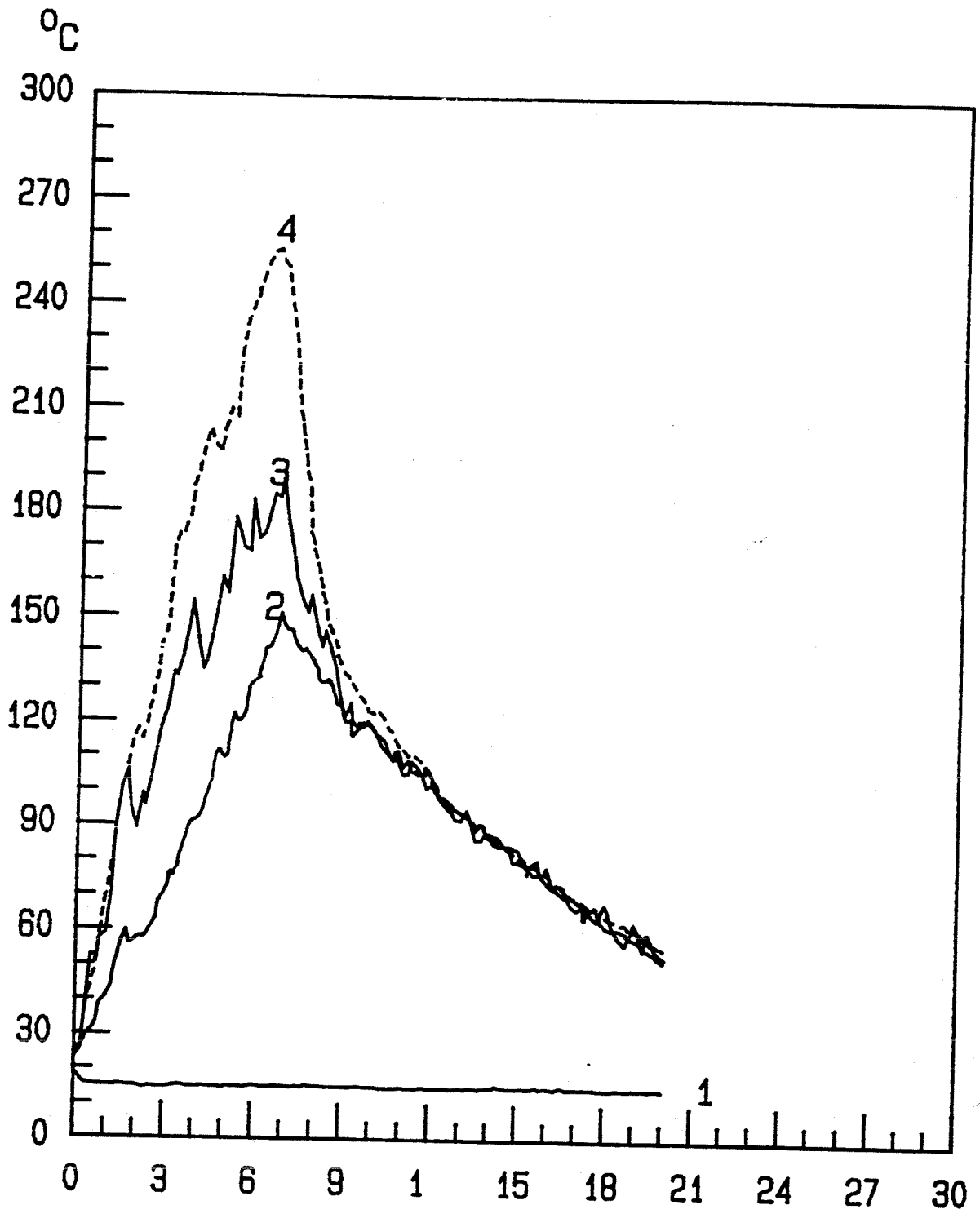
| Zeit nach Versuchsbeginn (min) | Flammenhöhe während des Brandversuches Nr. 2 am 17.10.1986 (cm) |
|--------------------------------------|---|
| 1. | 30. |
| 2. | 40. |
| 3. | 60. |
| 4. | 70. |
| 5. | 75. |
| 6. | 85. |
| 7. | 100. |
| 8. | 90. |
| 9. | 30. |
| 10. | 10. |
| 20. | erlöschen der Flammen |

| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 19.0 | 23.6 | 26.7 | 25.3 | 21.9 | 22.5 | 22.2 | 22.6 | 22.5 | 22.3 | 22.7 | 22.9 | 23.0 | 22.9 |
| 2.50 | 14.9 | 131.0 | 316.0 | 185.6 | 57.4 | 60.1 | 60.1 | 62.1 | 70.2 | 78.7 | 83.4 | 85.3 | 93.3 | 102.1 |
| 5.00 | 14.8 | 238.4 | 655.3 | 391.4 | 113.3 | 109.1 | 102.2 | 109.0 | 112.5 | 122.0 | 129.4 | 138.2 | 147.1 | 158.3 |
| 7.50 | 15.1 | 204.3 | 476.9 | 264.8 | 153.6 | 139.8 | 123.0 | 136.3 | 137.1 | 140.3 | 148.5 | 154.6 | 155.8 | 157.7 |
| 10.00 | 14.9 | 124.0 | 212.3 | 139.9 | 117.1 | 117.5 | 101.0 | 109.6 | 107.6 | 109.1 | 111.7 | 116.6 | 117.8 | 119.3 |
| 12.50 | 14.9 | 100.1 | 140.8 | 108.6 | 100.0 | 98.5 | 86.7 | 94.4 | 92.8 | 91.2 | 92.6 | 95.8 | 95.1 | 96.1 |
| 15.00 | 15.0 | 83.6 | 104.9 | 87.2 | 79.5 | 83.8 | 76.2 | 83.7 | 82.2 | 80.9 | 80.7 | 81.4 | 79.9 | 80.0 |
| 17.50 | 15.0 | 69.2 | 82.9 | 70.3 | 59.1 | 65.9 | 61.9 | 66.3 | 64.5 | 64.7 | 62.6 | 64.8 | 64.9 | 65.5 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 23.2 | 23.2 | 23.4 | 23.6 | 23.7 | 23.7 | 23.6 | 23.9 | 23.9 | 24.1 | 23.8 | 23.9 | 24.1 |
| 2.50 | 104.2 | 112.9 | 113.6 | 112.8 | 111.9 | 114.5 | 108.4 | 104.7 | 108.2 | 100.1 | 111.6 | 110.0 | 107.5 |
| 5.00 | 156.6 | 169.7 | 169.9 | 169.4 | 170.4 | 175.3 | 174.0 | 170.5 | 177.9 | 171.3 | 187.8 | 186.1 | 182.4 |
| 7.50 | 154.8 | 156.4 | 159.2 | 162.4 | 164.9 | 165.3 | 168.0 | 167.9 | 172.8 | 174.9 | 175.4 | 178.8 | 180.5 |
| 10.00 | 118.4 | 117.4 | 118.3 | 118.0 | 118.0 | 116.6 | 117.7 | 116.8 | 118.5 | 120.9 | 117.5 | 118.1 | 120.6 |
| 12.50 | 95.5 | 95.3 | 96.6 | 97.2 | 96.9 | 95.2 | 95.5 | 95.0 | 96.3 | 97.9 | 95.9 | 96.2 | 97.6 |
| 15.00 | 30.0 | 79.2 | 79.7 | 79.8 | 79.8 | 78.5 | 78.7 | 78.3 | 79.6 | 81.5 | 79.3 | 79.6 | 80.9 |
| 17.50 | 65.1 | 64.1 | 64.6 | 64.7 | 64.3 | 64.1 | 64.5 | 64.2 | 65.5 | 67.7 | 65.8 | 66.1 | 67.5 |

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 24.2 | 24.8 | 24.1 |
| 2.50 | 115.1 | 122.2 | 142.6 |
| 5.00 | 187.6 | 203.6 | 238.3 |
| 7.50 | 184.2 | 196.6 | 220.1 |
| 10.00 | 118.3 | 121.0 | 129.2 |
| 12.50 | 76.4 | 96.7 | 101.6 |
| 15.00 | 80.1 | 80.1 | 83.1 |
| 17.50 | 66.4 | 66.8 | 68.3 |

Temperaturen der Meßstellen 1 bis 30



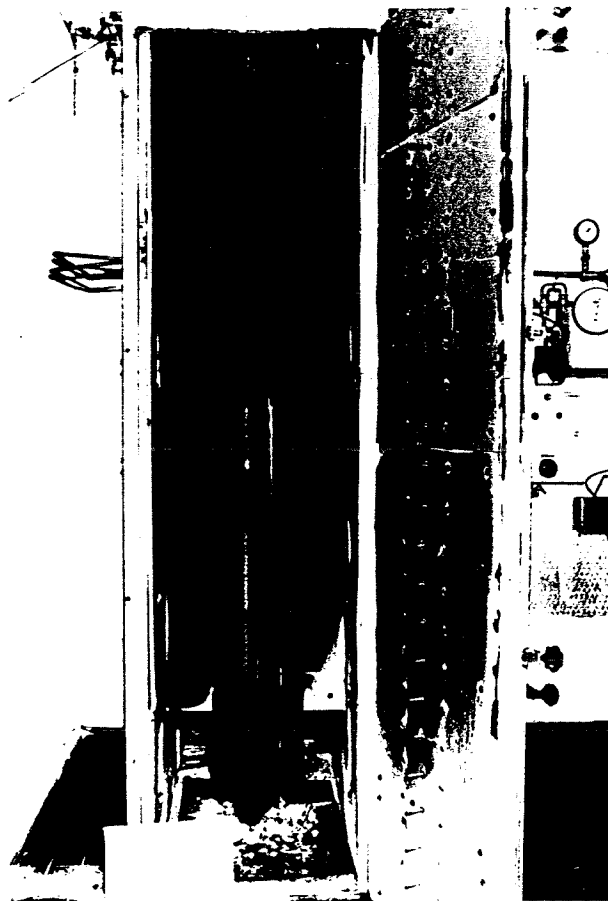
Temperaturen bei Versuch 39.1

Minuten

Versuch 39.1



Versuchsanordnung
vor dem Brandversuch



Versuchsanordnung
nach dem Brandver
such

Versuch Nr. : 39.2

Materialbeschreibung

Material Nr. 6.2 : Weichschaum auf synthetischer
Kautschukbasis

Abmessungen

Innendurchmesser/Außendurchmesser: 20 mm/ 60 mm
Wanddicke : 20 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 1 am 17.10.1986

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|--|
| 0' | Zündung des Gasbrenners. |
| 0' 30'' | Mäßige Rauchentwicklung. |
| 1' 50'' | Material bläht sich unmittelbar über dem Brenner auf. Es bilden sich Risse. |
| 3' 30'' | Auf einer Länge von ca. 25cm hat sich das Material auf der linken Seite vom Trägerrohr gelöst. |
| 6' 32'' | Flammen schlagen auf der linken Seite hinter die Rohre. |
| 7' 50'' | Am vertikalen Schenkel der linken Probe platzt auf einer Länge von ca. 20cm die Naht auf. |
| 9' | Teile fallen ab. |
| 15' | Linke Proben auf einer Länge von ca. 30cm horizontal und vertikal verkohlt. |
| 20' | Geringe Rauchentwicklung. Versuchsende. |

Beobachtungen nach dem Versuch von 20 Minuten Dauer

Unzerstörte Restlänge:

Probe 1(links): 1720 mm
Probe 2: 1710 mm
Probe 3: 1940 mm
Probe 4: 1940 mm

Brandversuch 39.2 am 17.10.1986

 Gasmenge 55,7 l/min Soll/Normzustand
 56,9 l/min Soll/Umgebung
 57,1 l/min Tats/Umgebung

Luftmenge 27,9 l/min Soll/Normzustand
 29,6 l/min Soll/Umgebung
 29,9 l/min Tats/Umgebung

T-Umgebung(Gas) 8 C
 P-Umgebung(Gas) 1020 mb
 T-Umgebung(Luft) 12 C
 P-Umgebung(Luft) 995 mb

 Zeit (min) Druck (Pa)

| | |
|----|-----|
| 1 | -14 |
| 2 | -15 |
| 3 | -15 |
| 5 | -15 |
| 6 | -15 |
| 12 | -15 |
| 19 | -14 |
| 20 | -14 |

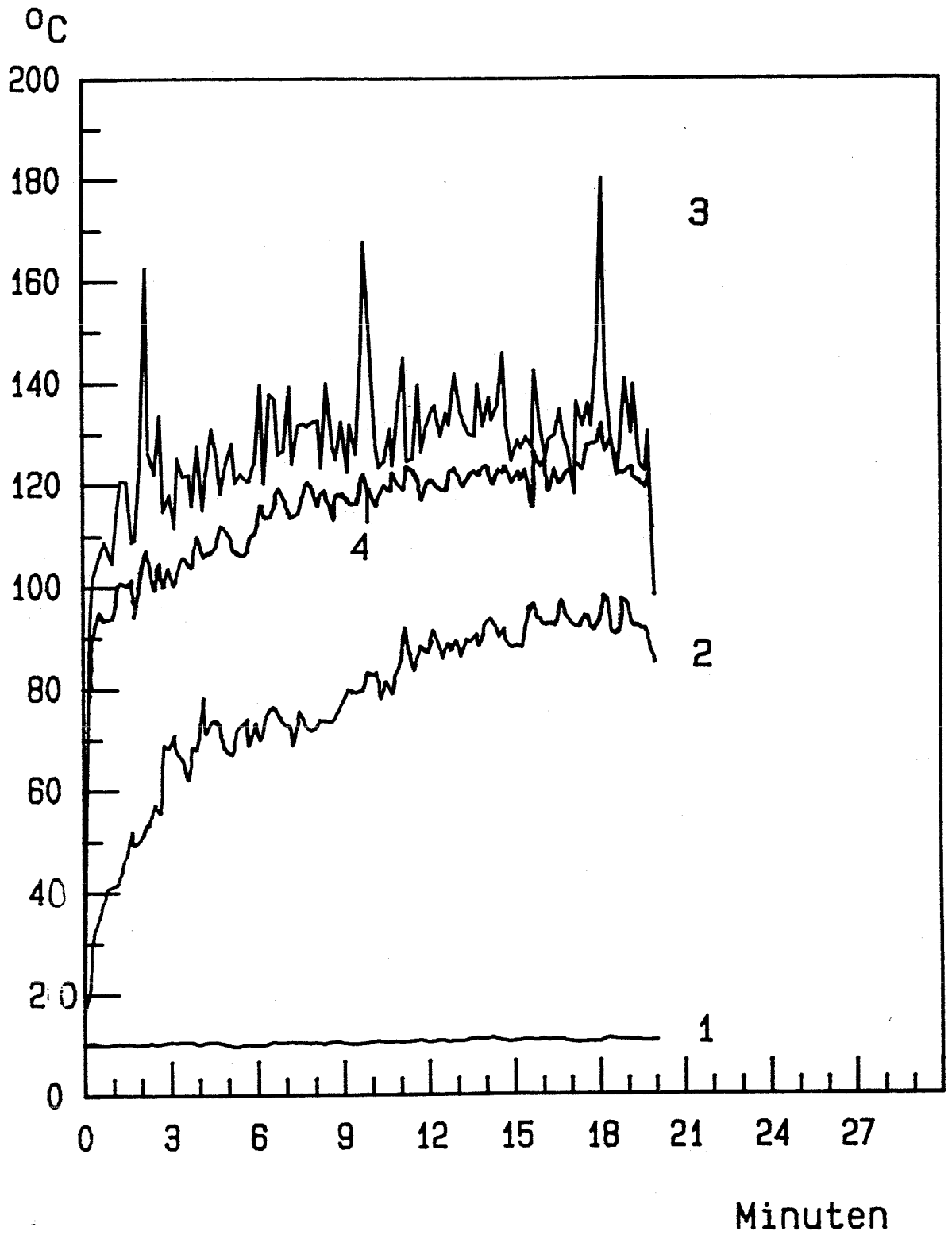
Versuch 39.2

| Zeit (min) | Zuluft (m ³ /min) |
|------------|------------------------------|
| 1 | 7,767 |
| 2 | 8,975 |
| 3 | 8,975 |
| 5 | 8,975 |
| 6 | 8,975 |
| 12 | 8,803 |
| 19 | 8,630 |
| 20 | 8,630 |

| Zeit (min) | Flammenhöhe (cm) |
|------------|-----------------------|
| 1 | 50 |
| 2 | 55 |
| 3 | 60 |
| 4 | 60 |
| 5 | 55 |
| 6 | 50 |
| 7 | 60 |
| 8 | 60 |
| 9 | 50 |
| 10 | 50 |
| 11 | 55 |
| 12 | 55 |
| 13 | 55 |
| 14 | 55 |
| 15 | 50 |
| 16 | 60 |
| 17 | 55 |
| 18 | 50 |
| 19 | 55 |
| 20 | Erlöschen der Flammen |

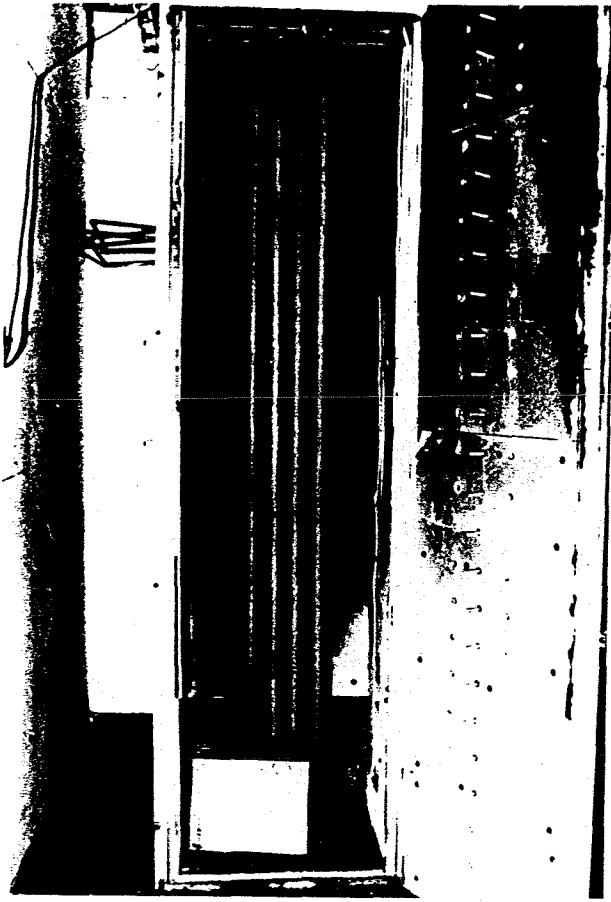
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 10.3 | 15.0 | 36.6 | 14.9 | 15.3 | 14.9 | 15.0 | 16.6 | 20.5 | 19.4 | 20.1 | 19.0 | 20.7 | 19.5 |
| 1.67 | 10.2 | 105.3 | 54.1 | 91.7 | 48.6 | 51.9 | 74.3 | 105.3 | 126.6 | 125.4 | 115.6 | 108.8 | 106.4 | 110.0 |
| 3.33 | 10.6 | 111.3 | 69.0 | 84.8 | 67.6 | 66.8 | 63.2 | 87.8 | 97.1 | 117.0 | 118.3 | 120.1 | 122.8 | 123.7 |
| 5.00 | 10.0 | 114.8 | 67.1 | 95.7 | 63.3 | 67.4 | 68.1 | 99.8 | 117.1 | 138.9 | 143.7 | 132.8 | 130.6 | 128.7 |
| 6.67 | 10.4 | 116.7 | 74.7 | 100.7 | 71.6 | 76.3 | 71.7 | 107.4 | 118.9 | 124.3 | 129.0 | 137.6 | 141.8 | 141.0 |
| 8.33 | 10.2 | 123.9 | 73.7 | 103.7 | 65.1 | 73.3 | 80.5 | 121.1 | 143.1 | 147.9 | 132.6 | 128.8 | 125.6 | 127.3 |
| 10.00 | 10.6 | 125.2 | 80.7 | 110.2 | 77.7 | 82.8 | 88.0 | 112.1 | 112.8 | 133.5 | 152.2 | 164.3 | 156.0 | 154.2 |
| 11.67 | 10.8 | 124.7 | 86.3 | 101.3 | 79.9 | 88.4 | 85.5 | 116.1 | 121.7 | 129.1 | 133.5 | 134.4 | 138.8 | 144.0 |
| 13.33 | 10.7 | 131.4 | 85.7 | 98.2 | 81.8 | 89.4 | 83.6 | 109.5 | 127.8 | 127.7 | 129.7 | 126.5 | 130.2 | 135.0 |
| 15.00 | 10.6 | 133.5 | 87.2 | 102.5 | 76.7 | 88.0 | 76.3 | 101.0 | 123.5 | 134.5 | 137.4 | 133.7 | 131.4 | 127.8 |
| 16.67 | 10.9 | 133.6 | 101.3 | 101.1 | 85.9 | 97.4 | 82.4 | 100.6 | 115.6 | 127.3 | 128.9 | 136.0 | 135.2 | 138.5 |
| 18.33 | 11.2 | 137.4 | 95.6 | 106.4 | 82.3 | 97.9 | 84.7 | 113.1 | 134.5 | 138.9 | 131.8 | 132.9 | 134.5 | 140.8 |
| 20.00 | 10.7 | 132.0 | 91.7 | 97.6 | 73.1 | 85.1 | 70.9 | 95.2 | 103.8 | 105.6 | 98.6 | 101.0 | 95.8 | 99.2 |
| Zeit/Mst (min) | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | | | | |
| 0.00 | 16.3 | 14.8 | 15.6 | 15.3 | 16.0 | 17.3 | 17.9 | 19.3 | 19.0 | 21.0 | | | | |
| 1.67 | 107.9 | 106.8 | 109.0 | 110.3 | 110.9 | 110.5 | 103.3 | 108.9 | 107.8 | 103.6 | | | | |
| 3.33 | 112.3 | 111.1 | 109.1 | 107.9 | 109.2 | 110.1 | 105.5 | 108.8 | 107.7 | 105.3 | | | | |
| 5.00 | 118.5 | 116.7 | 117.7 | 116.9 | 116.7 | 115.3 | 113.0 | 115.4 | 115.3 | 113.9 | | | | |
| 6.67 | 129.1 | 125.7 | 125.1 | 124.1 | 124.7 | 124.2 | 119.7 | 123.5 | 120.8 | 120.7 | | | | |
| 8.33 | 121.9 | 120.5 | 120.2 | 120.2 | 120.9 | 123.9 | 120.5 | 123.0 | 123.2 | 120.3 | | | | |
| 10.00 | 137.0 | 131.6 | 129.9 | 129.1 | 127.7 | 127.5 | 124.8 | 125.1 | 125.6 | 122.1 | | | | |
| 11.67 | 132.5 | 129.4 | 126.7 | 126.2 | 126.7 | 127.3 | 123.1 | 124.3 | 123.9 | 121.8 | | | | |
| 13.33 | 130.2 | 125.4 | 122.6 | 120.9 | 120.7 | 121.2 | 119.5 | 119.9 | 120.5 | 119.7 | | | | |
| 15.00 | 120.5 | 117.4 | 116.4 | 118.7 | 118.0 | 118.4 | 117.3 | 116.6 | 117.8 | 118.2 | | | | |
| 16.67 | 129.3 | 124.9 | 124.5 | 123.7 | 123.0 | 124.3 | 123.0 | 123.2 | 122.7 | 120.4 | | | | |
| 18.33 | 136.1 | 130.2 | 129.8 | 129.8 | 129.7 | 130.0 | 130.2 | 130.8 | 130.9 | 128.9 | | | | |
| 20.00 | 98.1 | 97.1 | 96.5 | 99.5 | 100.7 | 104.3 | 108.5 | 104.6 | 108.2 | 107.3 | | | | |
| Zeit/Mst (min) | 28 | 29 | 30 | | | | | | | | | | | |
| 0.00 | 23.3 | 19.1 | 16.4 | | | | | | | | | | | |
| 1.67 | 104.3 | 103.7 | 96.7 | | | | | | | | | | | |
| 3.33 | 104.6 | 106.7 | 95.0 | | | | | | | | | | | |
| 5.00 | 114.0 | 113.8 | 104.6 | | | | | | | | | | | |
| 6.67 | 120.1 | 120.7 | 110.8 | | | | | | | | | | | |
| 8.33 | 120.6 | 122.6 | 113.0 | | | | | | | | | | | |
| 10.00 | 122.0 | 122.5 | 112.4 | | | | | | | | | | | |
| 11.67 | 121.8 | 124.7 | 113.4 | | | | | | | | | | | |
| 13.33 | 119.7 | 124.5 | 114.5 | | | | | | | | | | | |
| 15.00 | 119.8 | 126.3 | 114.4 | | | | | | | | | | | |
| 16.67 | 122.5 | 126.2 | 111.0 | | | | | | | | | | | |
| 18.33 | 129.3 | 133.8 | 115.7 | | | | | | | | | | | |
| 20.00 | 109.5 | 113.6 | 111.3 | | | | | | | | | | | |

Temperaturen der Meßstellen 1 bis 30



Temperaturen bei Versuch 39.2

Versuch 39.2



Versuchsanordnung
vor dem Brandversuch



Versuchsanordnung
nach dem Brandversuch

Versuch Nr.: 39.3

Materialbeschreibung

Material Nr. 1.6 : Weichschaum auf synthetischer
Kautschukbasis

Abmessungen

Innendurchmesser/Außendurchmesser: 20 mm/40 mm
Wanddicke : 10 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr.39.3 am 20.03.1989

Zeit nach
Versuchsbeginn

Beobachtungen

| | |
|-----|---|
| 0' | Zündung des Gasbrenners. |
| 1' | Material verformt sich. Flammenhöhe ca. 70 cm |
| 5' | Material über der Zündkrippe zerstört. Flammenhöhe ca. 120 cm. |
| 9' | Holzkrippe brennt langsam aus. |
| 10' | Beobachtungen eingestellt. |

Beobachtungen nach dem Versuch

Unzerstörte mittlere Restlänge: 1250 mm

Das Probenmaterial ist im Bereich des Knies völlig zerstört.

| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 16.5 | 21.5 | 49.4 | 22.4 | 19.4 | 19.9 | 20.3 | 20.3 | 20.4 | 20.6 | 20.7 | 20.7 | 20.8 | 20.8 |
| 1.20 | 15.1 | 87.0 | 180.4 | 96.9 | 40.2 | 41.7 | 70.1 | 80.4 | 119.9 | 127.0 | 115.0 | 104.8 | 88.9 | 90.3 |
| 2.40 | 14.8 | 184.3 | 557.6 | 256.7 | 66.0 | 58.5 | 69.4 | 72.9 | 100.3 | 121.9 | 122.2 | 127.6 | 126.2 | 139.8 |
| 3.60 | 15.1 | 227.5 | 695.1 | 311.9 | 91.0 | 76.2 | 87.6 | 95.9 | 110.0 | 138.0 | 142.0 | 152.7 | 158.0 | 172.2 |
| 4.80 | 14.8 | 274.9 | 709.0 | 371.8 | 125.3 | 101.6 | 119.1 | 125.5 | 133.0 | 159.3 | 166.1 | 174.0 | 185.4 | 191.0 |
| 6.00 | 14.7 | 270.6 | 602.9 | 348.9 | 159.0 | 128.2 | 147.1 | 157.9 | 157.6 | 184.7 | 194.7 | 205.4 | 209.8 | 220.4 |
| 7.20 | 14.6 | 199.5 | 289.6 | 229.1 | 174.3 | 132.3 | 138.5 | 151.8 | 142.8 | 156.5 | 170.6 | 179.4 | 186.6 | 186.2 |
| 8.40 | 14.6 | 144.8 | 204.6 | 156.1 | 165.6 | 123.8 | 129.4 | 140.7 | 124.9 | 127.6 | 137.3 | 140.8 | 146.9 | 140.5 |
| 9.60 | 14.5 | 125.9 | 171.4 | 129.8 | 149.8 | 117.7 | 137.3 | 148.0 | 144.3 | 146.7 | 145.0 | 140.3 | 138.1 | 132.8 |

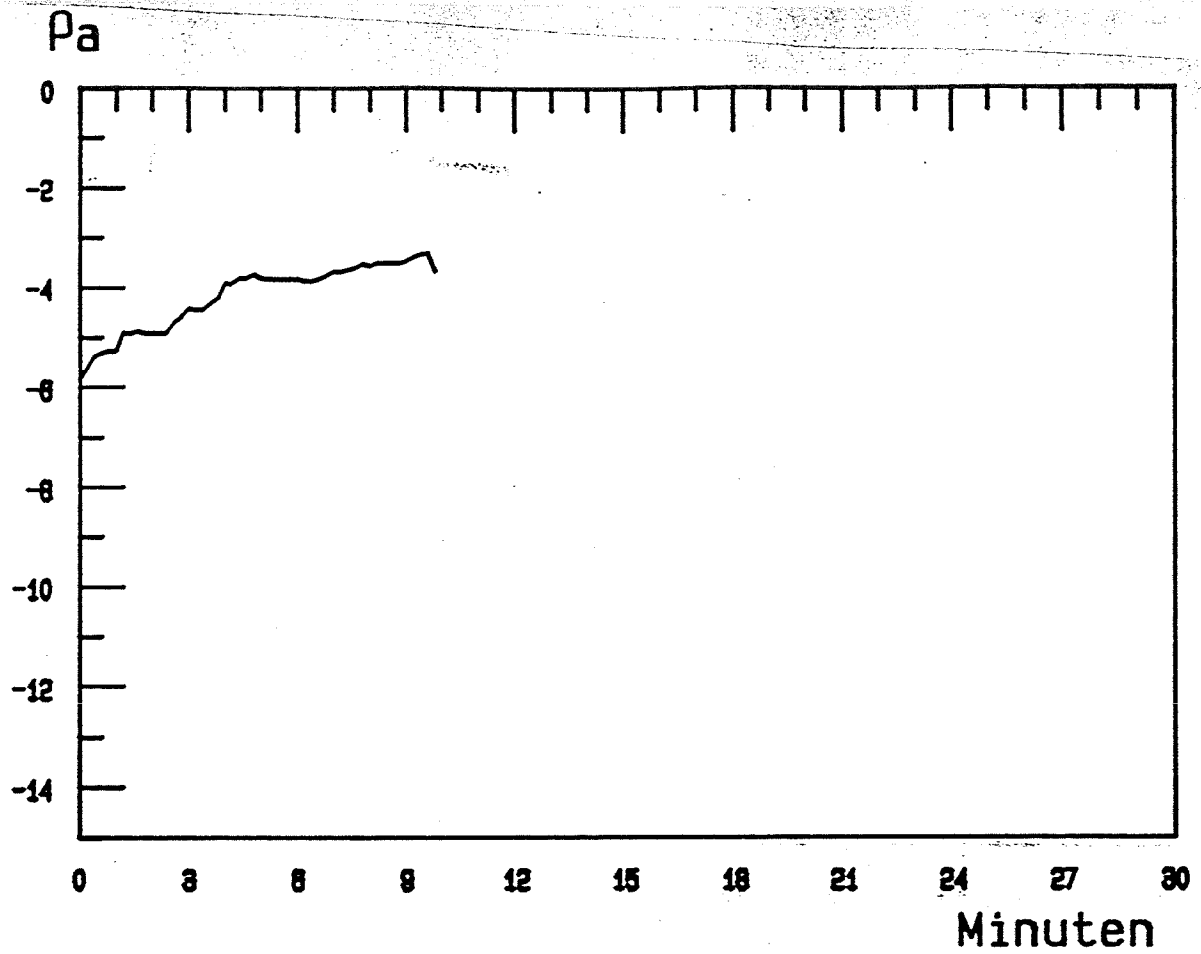
| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 20.8 | 21.0 | 21.1 | 21.1 | 21.1 | 21.3 | 21.5 | 21.8 | 21.5 | 21.2 | 22.1 | 22.0 | 21.8 |
| 1.20 | 103.7 | 110.8 | 112.3 | 103.8 | 85.6 | 109.3 | 90.0 | 102.5 | 99.1 | 74.5 | 94.8 | 95.4 | 80.5 |
| 2.40 | 153.1 | 180.4 | 188.4 | 186.0 | 164.0 | 203.1 | 181.2 | 207.1 | 210.9 | 175.7 | 213.6 | 214.5 | 187.7 |
| 3.60 | 196.9 | 225.1 | 237.3 | 231.2 | 212.0 | 235.6 | 221.9 | 233.9 | 234.9 | 209.9 | 231.9 | 231.8 | 214.3 |
| 4.80 | 204.0 | 229.7 | 249.6 | 249.2 | 234.1 | 262.2 | 254.6 | 273.1 | 270.5 | 247.5 | 279.5 | 277.5 | 258.0 |
| 6.00 | 237.1 | 255.0 | 258.8 | 264.9 | 259.3 | 277.7 | 273.6 | 287.1 | 287.7 | 273.5 | 292.8 | 289.8 | 268.1 |
| 7.20 | 190.6 | 191.9 | 194.7 | 196.8 | 199.7 | 196.4 | 200.9 | 199.4 | 200.1 | 205.5 | 197.0 | 195.5 | 192.9 |
| 8.40 | 139.1 | 131.8 | 135.4 | 139.4 | 149.8 | 138.2 | 147.0 | 141.2 | 142.4 | 155.3 | 139.7 | 138.9 | 143.4 |
| 9.60 | 131.4 | 126.5 | 125.3 | 124.9 | 129.9 | 122.2 | 127.0 | 123.1 | 123.7 | 131.5 | 121.4 | 121.4 | 123.9 |

Temperaturen der Meßstellen 1 bis 27 bei Versuch 39.3

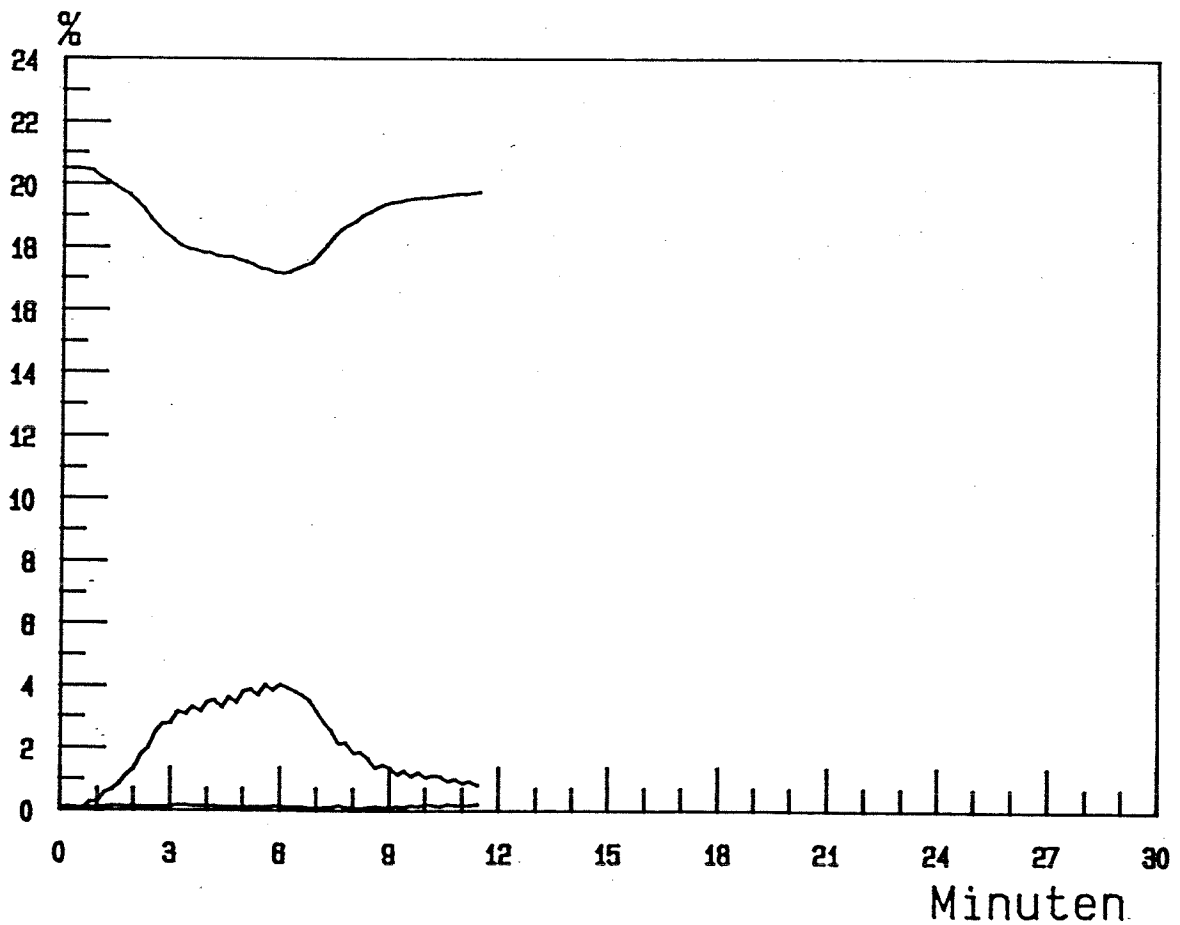
| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|----|----|----|
|-------------------|----|----|----|

| | | | |
|------|-------|-------|-------|
| 0.00 | 22.0 | 21.9 | 22.1 |
| 1.20 | 86.8 | 81.6 | 87.8 |
| 2.40 | 200.3 | 190.3 | 199.4 |
| 3.60 | 225.1 | 221.6 | 235.6 |
| 4.80 | 267.4 | 256.9 | 272.4 |
| 6.00 | 275.4 | 267.0 | 268.0 |
| 7.20 | 192.8 | 193.4 | 193.0 |
| 8.40 | 140.2 | 144.4 | 141.9 |
| 9.60 | 121.2 | 125.2 | 122.1 |

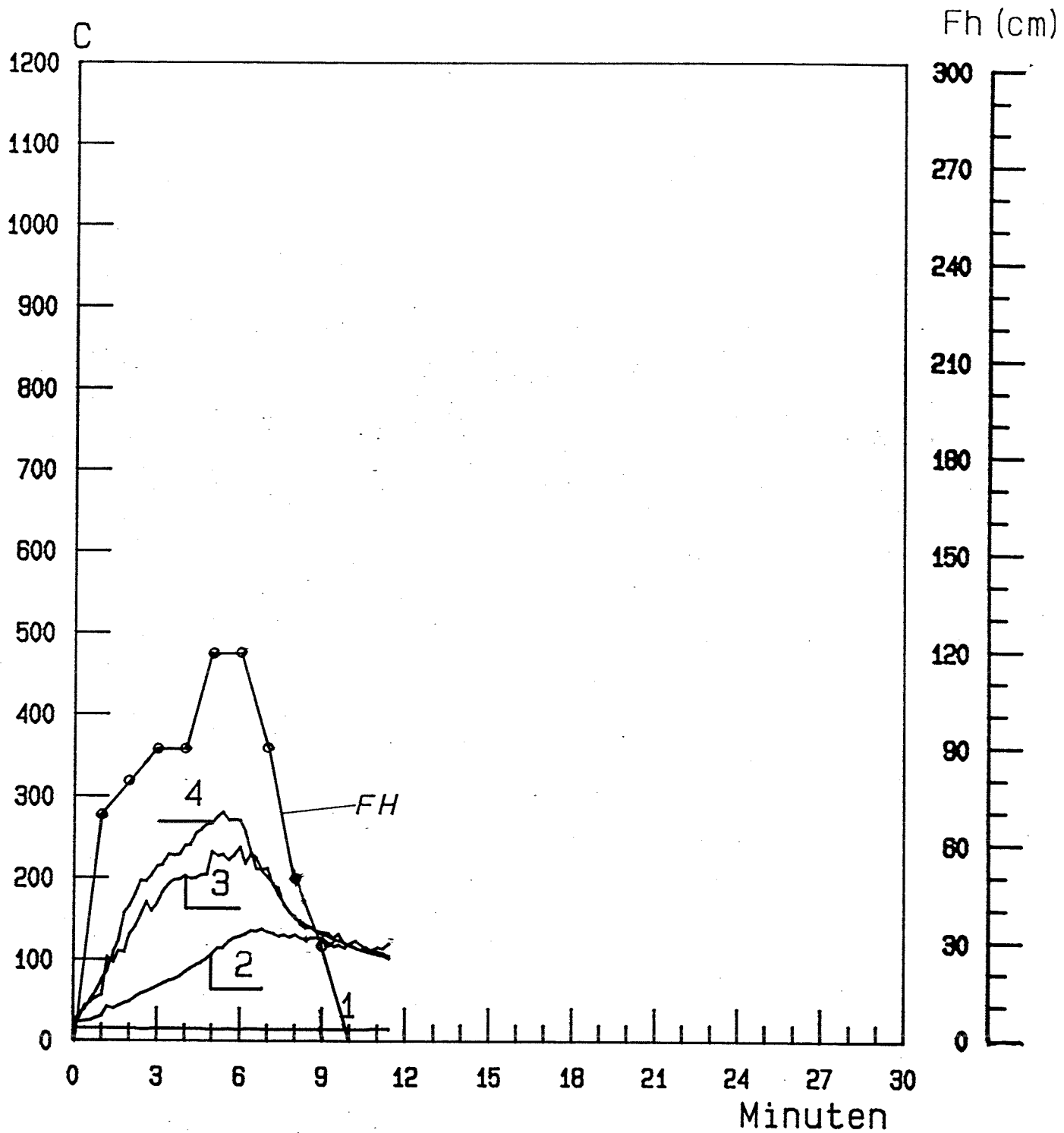
Temperaturen der Meßstellen 28 bis 30 bei Versuch 39.3



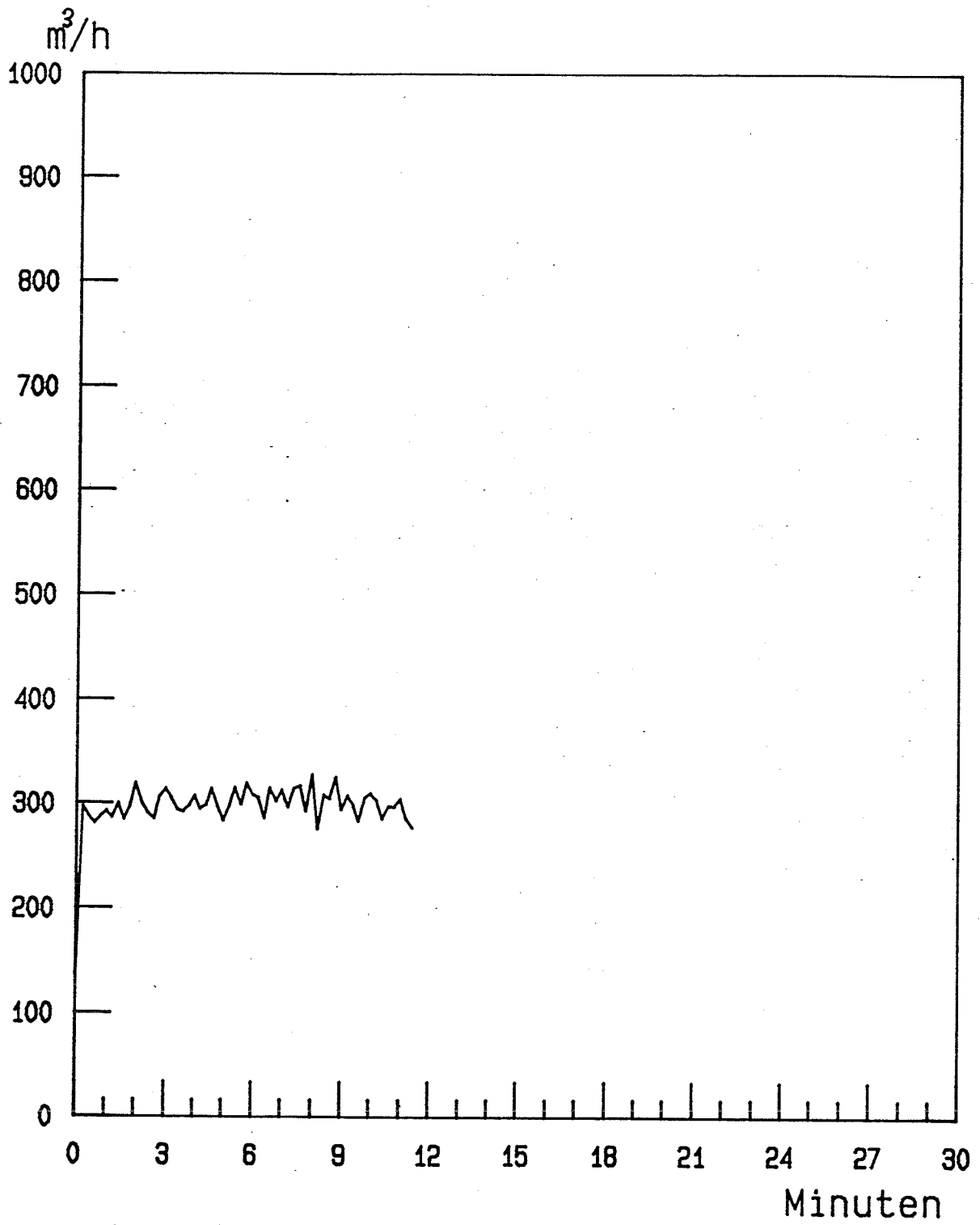
Druckverlauf im Brandraum
bei Versuch 39.3



CO₂, CO, O₂ - Gehalt bei Versuch 39.3



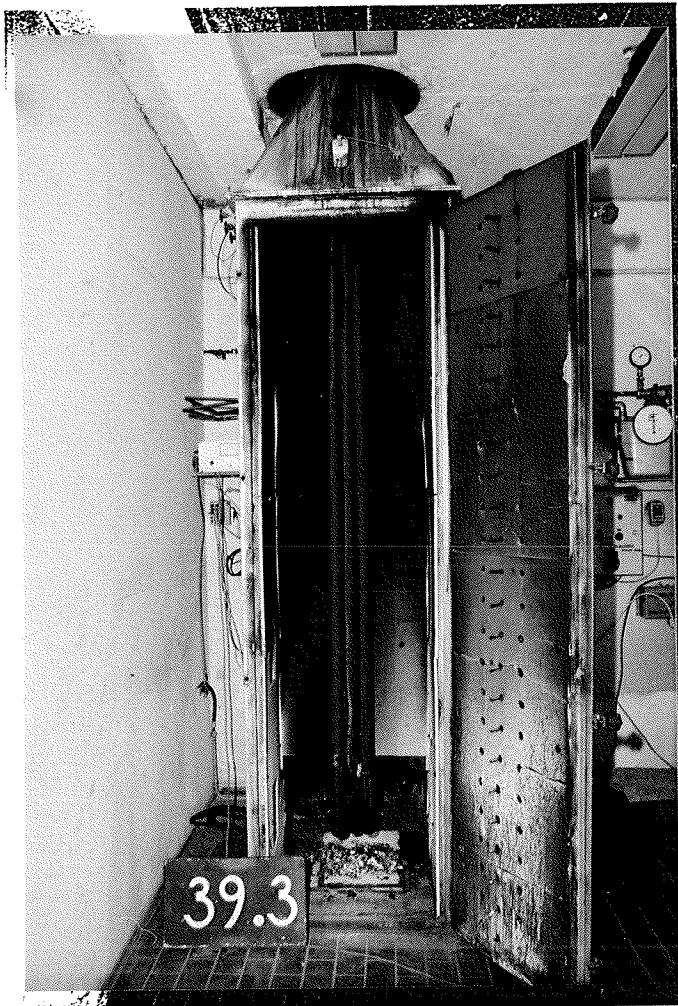
Temperatur und Flammenhoehe
bei Versuch 39.3



Zuluftrate bei Versuch 39.3



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 39.4

Materialbeschreibung

Material Nr. 1.6 : Weichschaum auf synthetischer
Kautschukbasis

Abmessungen

Innendurchmesser/Außendurchmesser: 20 mm/40 mm
Wanddicke : 10 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr.39.4 am 17.03.1989

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung des Gasbrenners. |
| 1' | Material verformt sich.Flammenhöhe ca 90 cm. |
| 2'- 3' | Material brennt leicht mit.Flammenhöhe 80 cm. |
| 6'-9' | Flammenhöhe ca. 80 cm. |
| 11' | Beobachtungen eingestellt. |

Beobachtungen nach dem Versuch

Unzerstörte mittlere Restlänge: 1513 mm

Das Probenmaterial ist im Bereich des Knies völlig zerstört.

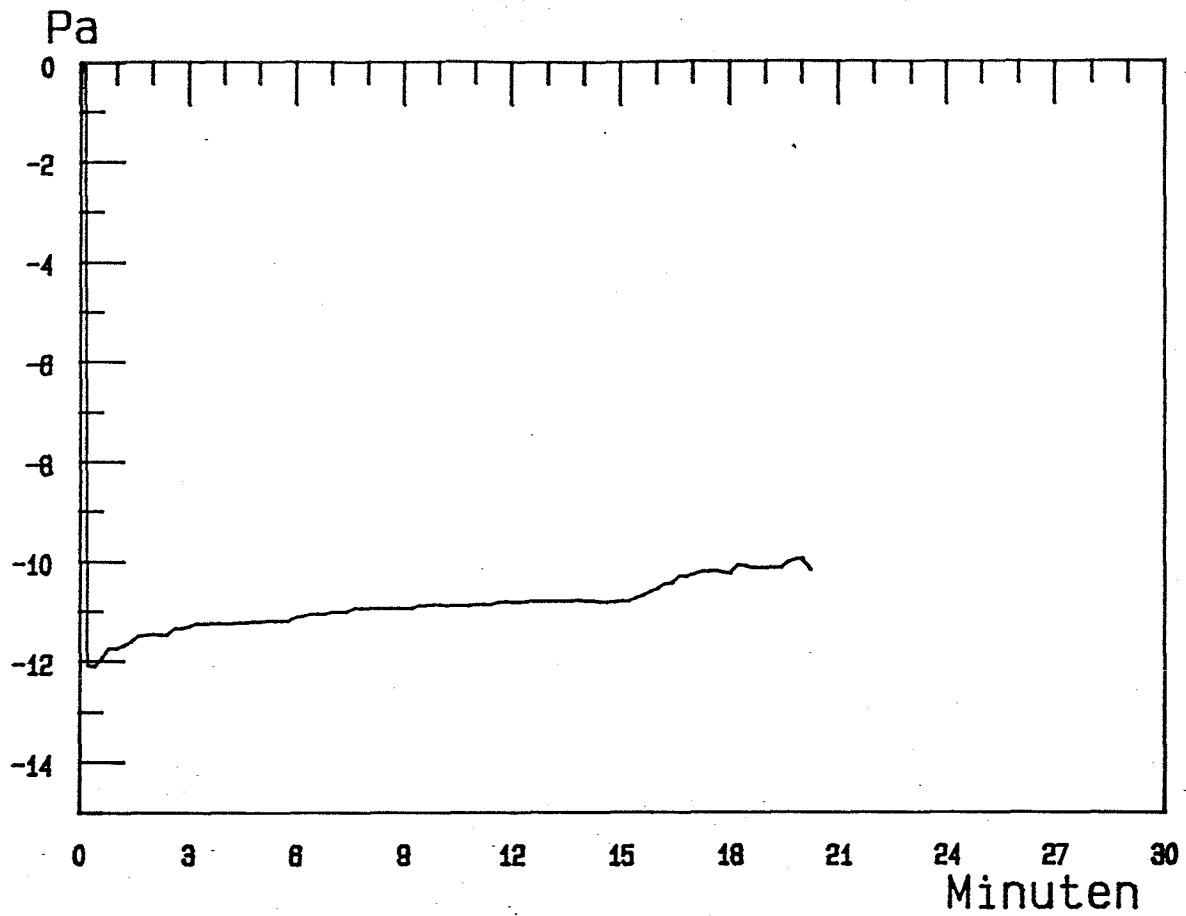
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 21.6 | 14.8 | 27.6 | 21.6 | 15.9 | 17.1 | 32.7 | 37.3 | 42.0 | 21.6 | 23.6 | 23.5 | 21.6 | 19.2 |
| 1.20 | 3.6 | 118.4 | 67.5 | 110.3 | 58.4 | 62.9 | 149.5 | 200.1 | 198.8 | 172.8 | 148.4 | 135.3 | 125.1 | 114.8 |
| 2.40 | 3.6 | 120.6 | 87.7 | 134.4 | 78.4 | 73.0 | 109.9 | 187.6 | 223.0 | 195.3 | 169.1 | 157.2 | 137.2 | 131.0 |
| 3.60 | 3.7 | 126.6 | 72.9 | 119.7 | 85.9 | 81.9 | 164.6 | 247.2 | 269.1 | 240.9 | 190.6 | 171.0 | 156.9 | 144.7 |
| 4.80 | 3.7 | 128.4 | 86.7 | 124.0 | 93.3 | 84.2 | 131.6 | 201.4 | 176.0 | 178.1 | 169.9 | 158.7 | 147.5 | 134.2 |
| 6.00 | 3.7 | 132.2 | 90.3 | 139.1 | 98.7 | 85.5 | 118.9 | 207.2 | 175.5 | 172.8 | 163.7 | 154.2 | 147.0 | 136.0 |
| 7.20 | 3.8 | 135.2 | 96.3 | 126.8 | 100.7 | 95.9 | 193.8 | 273.0 | 236.8 | 183.3 | 164.8 | 152.5 | 143.6 | 130.0 |
| 8.40 | 3.8 | 136.3 | 93.9 | 139.3 | 106.8 | 94.4 | 145.4 | 215.8 | 208.8 | 190.8 | 178.9 | 170.3 | 164.6 | 154.6 |
| 9.60 | 3.8 | 142.3 | 102.3 | 137.8 | 105.1 | 95.8 | 182.2 | 288.7 | 262.7 | 196.6 | 178.5 | 154.6 | 152.3 | 136.7 |
| 10.80 | 3.8 | 137.4 | 106.6 | 135.6 | 114.0 | 95.6 | 109.4 | 192.7 | 178.6 | 174.2 | 171.1 | 169.1 | 164.8 | 154.1 |
| 12.00 | 3.9 | 144.9 | 95.1 | 123.2 | 111.6 | 100.8 | 156.7 | 271.1 | 289.5 | 262.5 | 224.3 | 195.8 | 184.3 | 170.2 |
| 13.20 | 3.9 | 147.4 | 101.0 | 117.5 | 109.8 | 101.8 | 258.7 | 298.5 | 257.0 | 189.4 | 162.9 | 149.7 | 155.1 | 143.0 |
| 14.40 | 3.9 | 145.2 | 113.8 | 135.1 | 116.2 | 101.2 | 164.2 | 258.7 | 262.6 | 224.7 | 189.3 | 176.2 | 167.7 | 152.3 |
| 15.60 | 3.9 | 142.9 | 104.5 | 135.0 | 116.5 | 98.6 | 126.5 | 229.2 | 214.0 | 238.5 | 216.4 | 197.2 | 179.1 | 166.8 |
| 16.80 | 3.8 | 143.4 | 95.0 | 128.1 | 117.0 | 106.3 | 221.1 | 283.8 | 236.1 | 209.1 | 199.5 | 182.2 | 183.1 | 170.2 |
| 18.00 | 3.9 | 145.2 | 102.5 | 130.3 | 121.0 | 104.7 | 173.8 | 275.6 | 262.7 | 231.2 | 205.7 | 192.8 | 180.0 | 168.8 |
| 19.20 | 4.0 | 144.4 | 98.0 | 133.0 | 123.2 | 107.5 | 158.8 | 261.3 | 247.8 | 233.2 | 212.7 | 197.5 | 181.6 | 170.4 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 22.4 | 19.7 | 17.8 | 20.0 | 25.0 | 27.3 | 26.8 | 27.4 | 25.4 | 24.1 | 26.3 | 24.4 | 22.4 |
| 1.20 | 118.1 | 127.1 | 124.2 | 119.9 | 103.8 | 124.8 | 112.0 | 123.8 | 120.1 | 102.2 | 121.6 | 120.2 | 104.2 |
| 2.40 | 132.9 | 130.6 | 127.1 | 123.2 | 114.6 | 125.1 | 116.7 | 124.8 | 122.7 | 109.3 | 119.1 | 119.7 | 106.4 |
| 3.60 | 139.7 | 135.9 | 134.0 | 129.7 | 121.9 | 132.9 | 126.5 | 132.9 | 131.6 | 122.1 | 129.8 | 128.0 | 115.9 |
| 4.80 | 131.5 | 132.6 | 134.0 | 130.8 | 123.1 | 131.9 | 126.4 | 130.4 | 128.8 | 123.5 | 127.7 | 126.2 | 116.1 |
| 6.00 | 134.2 | 128.5 | 128.5 | 126.1 | 120.8 | 127.0 | 123.9 | 127.0 | 125.9 | 120.6 | 123.8 | 124.0 | 116.0 |
| 7.20 | 125.2 | 121.2 | 122.5 | 122.7 | 121.3 | 129.4 | 127.5 | 131.8 | 131.4 | 126.8 | 131.7 | 131.3 | 124.4 |
| 8.40 | 148.9 | 149.9 | 147.8 | 144.4 | 137.3 | 148.5 | 141.8 | 145.6 | 142.9 | 134.9 | 139.1 | 137.1 | 125.9 |
| 9.60 | 139.0 | 134.2 | 137.7 | 137.6 | 134.9 | 143.3 | 138.5 | 141.4 | 140.7 | 134.1 | 138.2 | 137.3 | 129.6 |
| 10.80 | 154.6 | 149.4 | 148.8 | 145.0 | 137.9 | 144.5 | 140.0 | 142.7 | 142.7 | 137.1 | 141.3 | 139.3 | 130.6 |
| 12.00 | 167.3 | 168.3 | 166.2 | 163.2 | 155.8 | 166.1 | 156.0 | 159.3 | 155.4 | 145.4 | 150.7 | 146.9 | 136.8 |
| 13.20 | 137.8 | 135.9 | 136.2 | 138.9 | 137.0 | 139.5 | 138.8 | 140.1 | 139.7 | 136.5 | 136.1 | 134.7 | 129.3 |
| 14.40 | 152.0 | 147.5 | 144.9 | 141.7 | 139.2 | 147.7 | 144.2 | 149.2 | 149.4 | 142.3 | 149.0 | 147.2 | 137.7 |
| 15.60 | 165.6 | 164.4 | 160.3 | 154.5 | 149.3 | 157.6 | 150.5 | 154.2 | 151.2 | 143.2 | 146.7 | 145.9 | 136.4 |
| 16.80 | 170.3 | 169.3 | 166.7 | 167.4 | 159.5 | 168.7 | 157.4 | 160.5 | 156.7 | 147.1 | 152.0 | 150.8 | 142.2 |
| 18.00 | 165.4 | 161.4 | 156.4 | 150.8 | 145.3 | 149.0 | 146.5 | 150.1 | 148.9 | 143.5 | 146.4 | 146.3 | 137.6 |
| 19.20 | 167.9 | 168.1 | 165.4 | 162.1 | 154.8 | 161.8 | 155.4 | 161.3 | 159.3 | 149.3 | 154.6 | 151.4 | 141.5 |

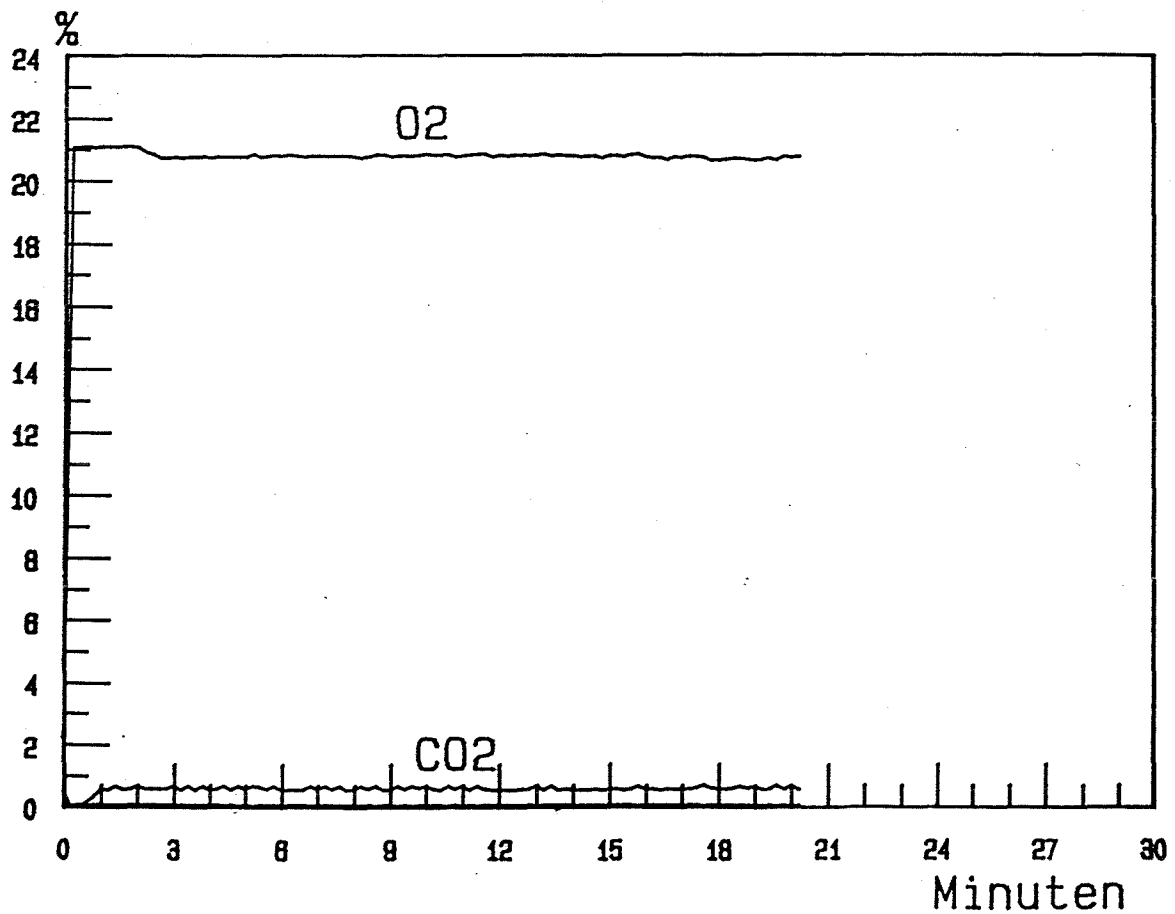
Temperaturen der Meßstellen 1 bis 27 bei Versuch 39.4

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 22.0 | 21.0 | 17.2 |
| 1.20 | 111.3 | 107.8 | 108.4 |
| 2.40 | 112.5 | 111.5 | 118.9 |
| 3.60 | 119.5 | 120.1 | 116.8 |
| 4.80 | 120.8 | 122.9 | 118.9 |
| 6.00 | 118.8 | 121.6 | 123.1 |
| 7.20 | 128.1 | 129.5 | 127.1 |
| 8.40 | 129.2 | 130.5 | 128.8 |
| 9.60 | 133.1 | 133.5 | 129.1 |
| 10.80 | 133.2 | 134.3 | 131.0 |
| 12.00 | 138.9 | 138.8 | 130.6 |
| 13.20 | 131.4 | 137.3 | 130.4 |
| 14.40 | 140.0 | 139.4 | 136.2 |
| 15.60 | 137.5 | 138.1 | 134.0 |
| 16.80 | 143.6 | 142.3 | 136.4 |
| 18.00 | 139.0 | 140.3 | 136.7 |
| 19.20 | 143.5 | 142.7 | 138.4 |

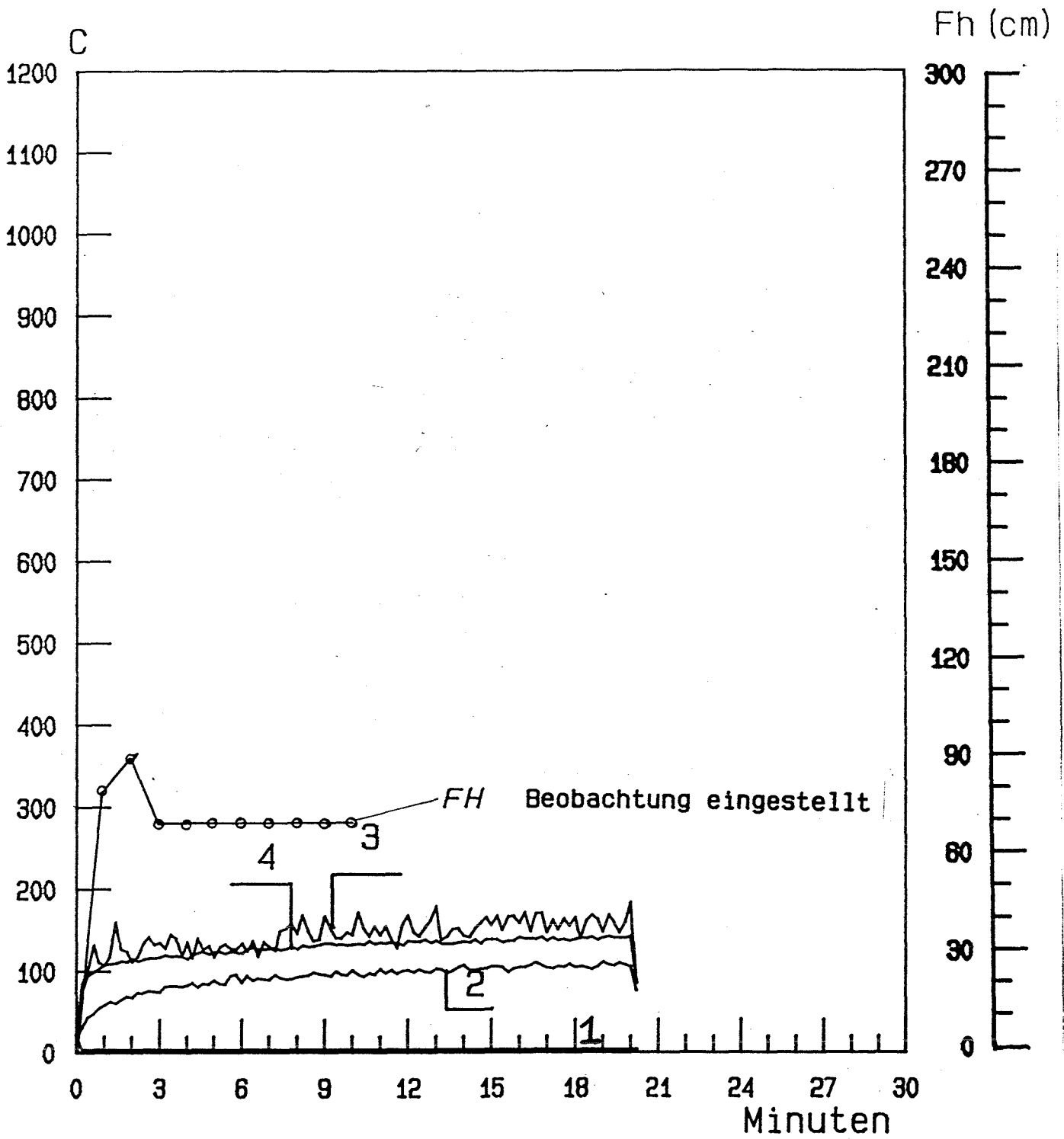
Temperaturen der Meßstellen 28 bis 30 bei Versuch 39.4



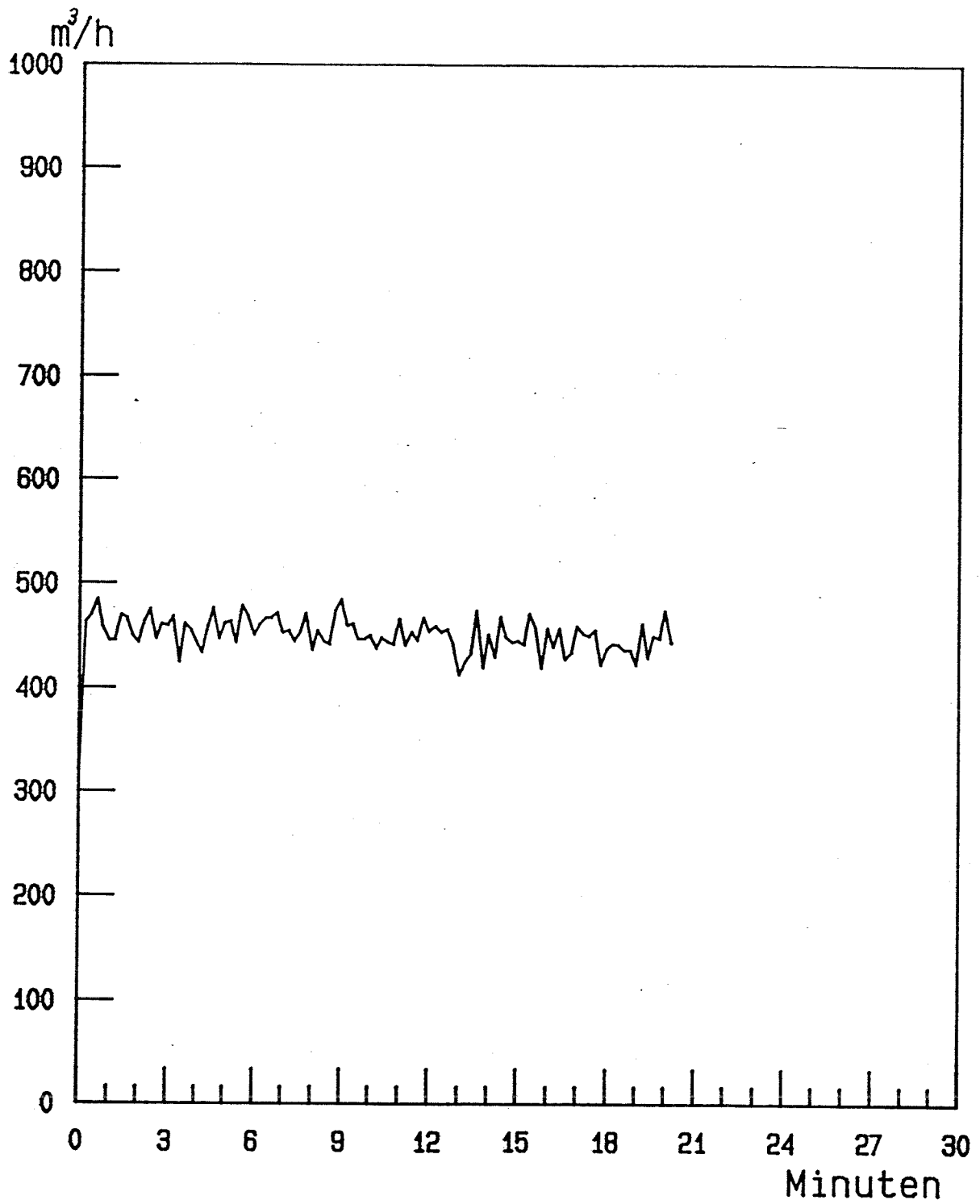
Druckverlauf im Brandraum
bei Versuch 39.4



CO2, CO, O2 - Gehalt
bei Versuch 39.4



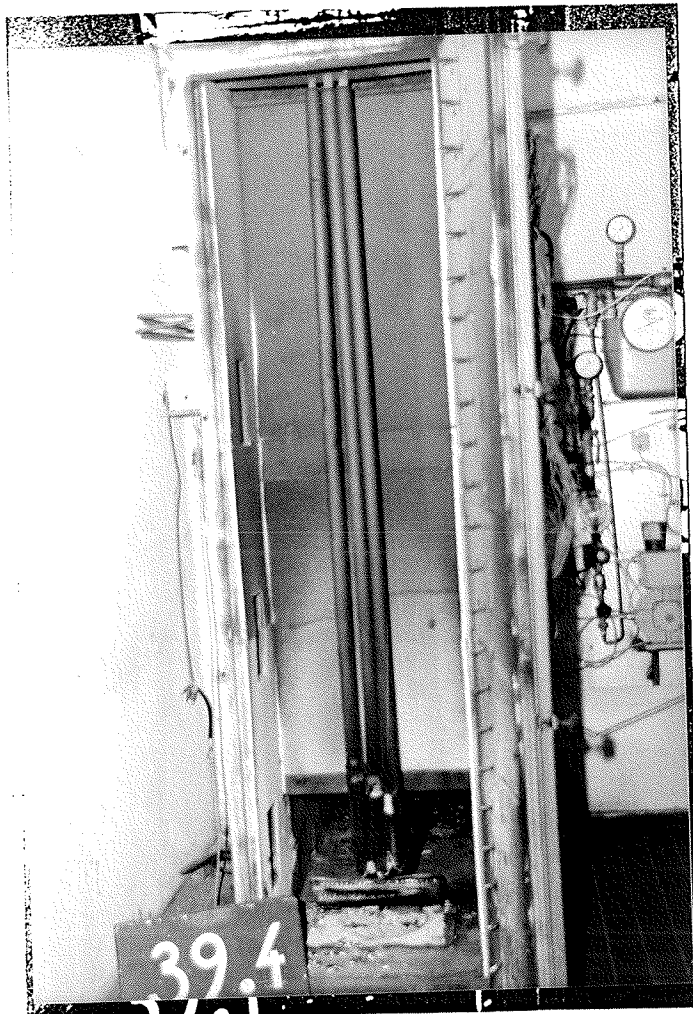
Temperaturverlauf und Flammenhoehe
bei Versuch 39.4



Zuluftrate bei Versuch 39.4



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 39.5

Materialbeschreibung

Material Nr. 1.6 : Weichschaum auf synthetischer Kautschukbasis

Abmessungen

Innendurchmesser/Außendurchmesser: 20 mm/60 mm
Wanddicke : 20 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr.39.5 am 21.03.1989

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|--|
| 0' | Zündung der Holzkrippe mit Petroleum getränkten Weichfaserdämmstreifen. |
| 1' | Flammenhöhe zeitweilig 60 cm. |
| 2'- 3' | Material platz im Kniebereich auf. Flammenhöhe zeitweilig 90-100 cm. |
| 4'- 5' | Material über der Krippe zerstört Teile fallen ab. Flammenspitzen bis 120 cm. |
| 7'- 8' | Material im Bereich des Knies und des horizontalen Schenkels zerstört. |
| 9' | Holzkrippe ausgebrannt. |
| 11' | Beobachtungen eingestellt. |

Beobachtungen nach dem Versuch

Unzerstörte mittlere Restlänge: 0 mm

Das Probenmaterial ist im Bereich des Knies und an der Innenseite der Rohre vollständig zerstört.

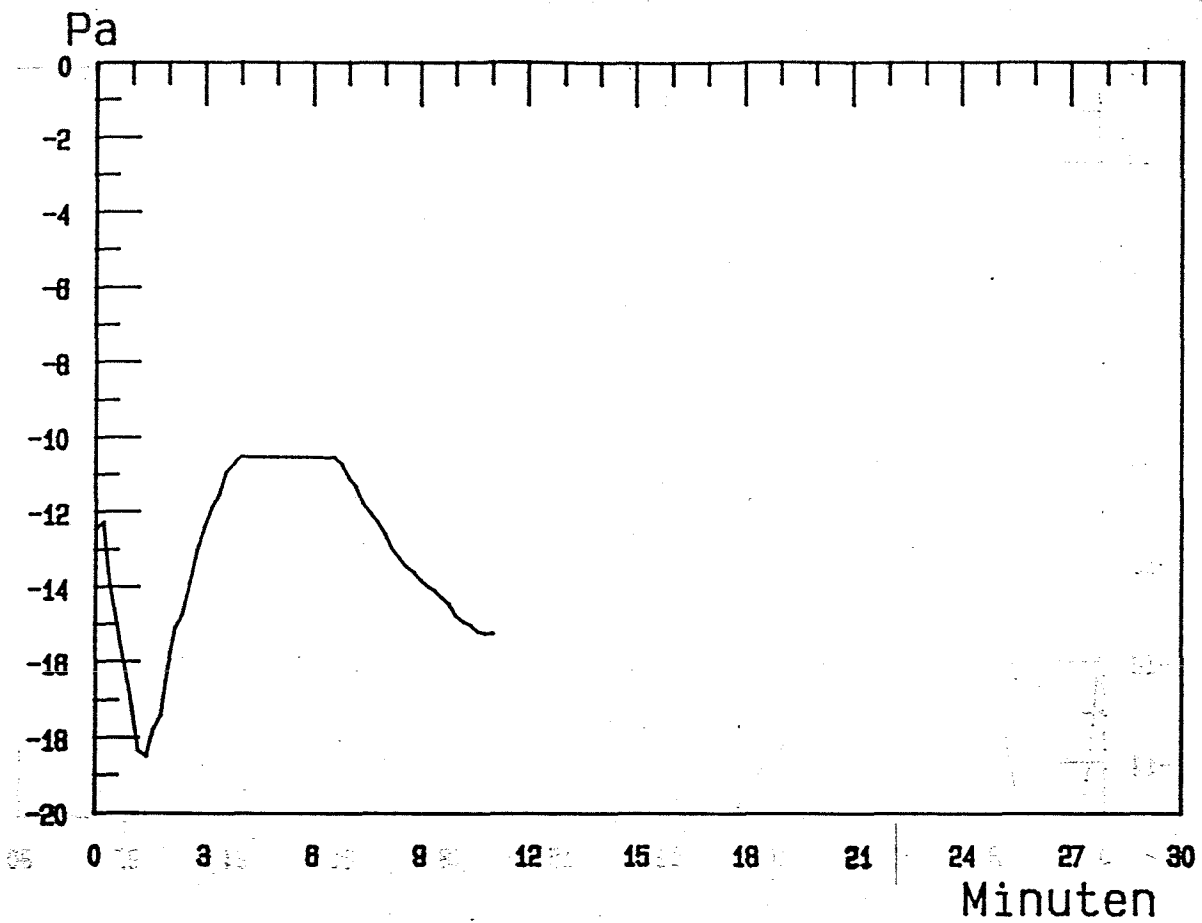
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 7.3 | 21.4 | 17.0 | 19.3 | 15.7 | 16.2 | 18.0 | 17.5 | 18.8 | 19.6 | 19.0 | 18.5 | 18.5 | 18.5 |
| 1.20 | 7.0 | 83.7 | 228.4 | 101.8 | 35.3 | 33.6 | 37.8 | 31.7 | 39.1 | 45.3 | 46.7 | 44.0 | 45.7 | 43.3 |
| 2.40 | 6.8 | 188.4 | 514.3 | 296.3 | 65.4 | 59.1 | 62.4 | 58.0 | 65.1 | 82.4 | 88.4 | 92.0 | 96.2 | 98.1 |
| 3.60 | 7.1 | 212.0 | 731.5 | 303.6 | 91.6 | 72.9 | 74.3 | 73.7 | 67.2 | 77.8 | 96.4 | 106.8 | 115.3 | 118.1 |
| 4.80 | 7.1 | 228.5 | 871.6 | 349.3 | 115.1 | 92.1 | 94.2 | 96.7 | 91.5 | 105.1 | 113.6 | 116.8 | 126.5 | 127.5 |
| 6.00 | 7.0 | 255.1 | 848.8 | 383.1 | 115.3 | 97.0 | 102.2 | 113.5 | 104.4 | 113.4 | 125.2 | 131.1 | 139.2 | 141.7 |
| 7.20 | 7.1 | 176.0 | 444.6 | 230.8 | 121.1 | 96.5 | 95.9 | 107.7 | 95.0 | 99.6 | 112.7 | 116.0 | 121.4 | 119.4 |
| 8.40 | 7.1 | 133.0 | 291.7 | 156.0 | 119.4 | 91.5 | 87.5 | 100.1 | 87.3 | 87.8 | 99.2 | 104.3 | 107.7 | 103.5 |
| 9.60 | 7.2 | 115.7 | 225.9 | 130.5 | 116.0 | 87.3 | 84.5 | 96.6 | 82.8 | 82.3 | 89.4 | 93.0 | 96.8 | 93.1 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 18.3 | 20.7 | 20.8 | 19.9 | 19.0 | 21.1 | 19.8 | 20.7 | 20.4 | 18.7 | 20.8 | 21.1 | 20.5 |
| 1.20 | 47.2 | 59.2 | 64.0 | 61.4 | 55.4 | 64.0 | 50.7 | 61.3 | 64.6 | 53.9 | 72.3 | 73.0 | 62.5 |
| 2.40 | 103.2 | 126.1 | 132.8 | 126.6 | 113.9 | 145.5 | 134.8 | 158.3 | 159.9 | 134.8 | 169.1 | 170.8 | 146.9 |
| 3.60 | 129.3 | 153.8 | 165.5 | 162.3 | 152.2 | 178.1 | 169.2 | 183.2 | 185.8 | 172.0 | 199.2 | 195.7 | 182.7 |
| 4.80 | 138.0 | 156.8 | 174.0 | 174.8 | 171.1 | 191.4 | 186.3 | 198.9 | 205.3 | 190.3 | 209.5 | 204.7 | 194.7 |
| 6.00 | 147.0 | 170.5 | 190.0 | 192.2 | 190.1 | 206.2 | 203.8 | 218.1 | 222.4 | 215.0 | 233.0 | 228.5 | 219.5 |
| 7.20 | 121.8 | 123.5 | 131.1 | 139.0 | 148.9 | 147.0 | 155.1 | 154.8 | 159.4 | 170.9 | 162.7 | 164.1 | 165.5 |
| 8.40 | 103.3 | 102.5 | 105.5 | 107.0 | 116.1 | 107.7 | 118.5 | 113.9 | 117.7 | 133.7 | 116.5 | 119.9 | 126.1 |
| 9.60 | 93.5 | 92.4 | 94.8 | 94.8 | 100.3 | 95.5 | 101.4 | 99.8 | 101.9 | 112.7 | 102.1 | 105.3 | 109.7 |

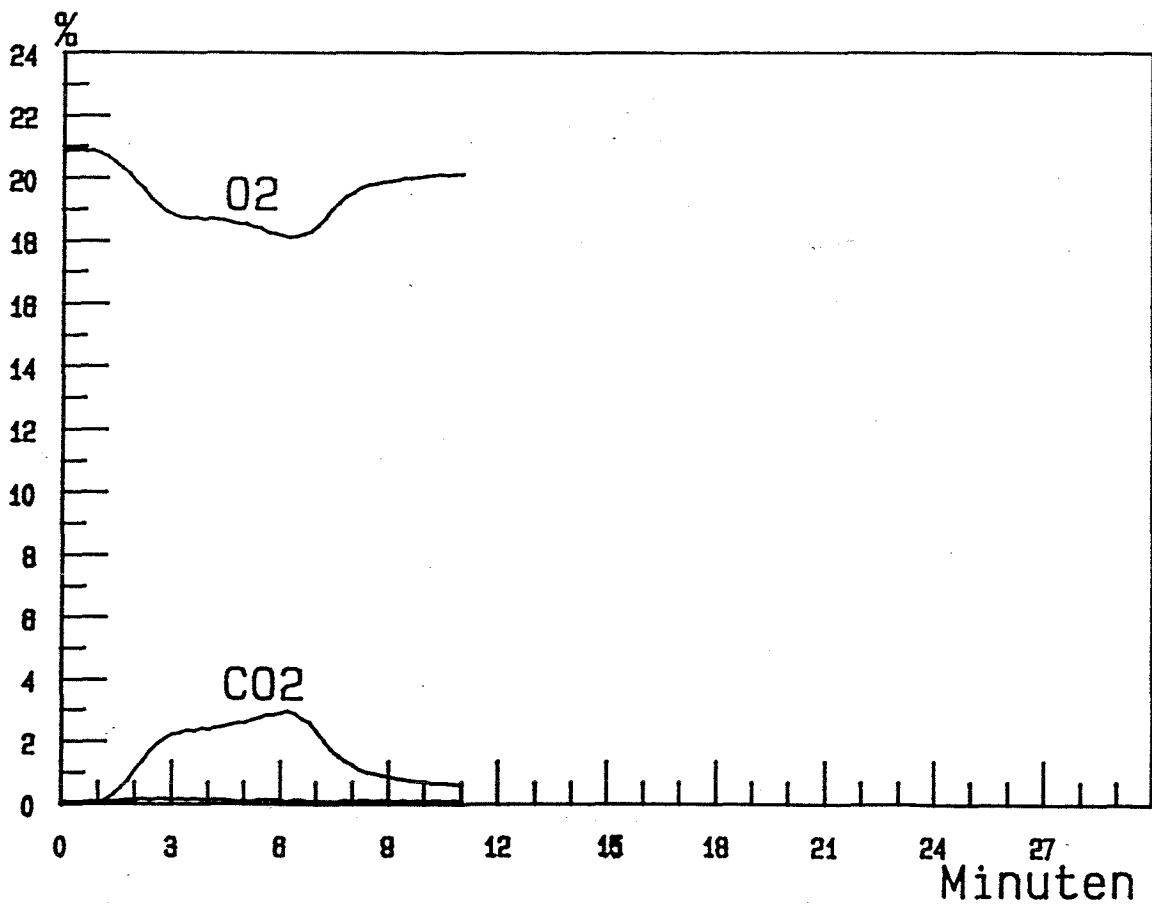
Temperaturen der Meßstellen 1 bis 27 bei Versuch 39.5

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 20.8 | 20.0 | 21.5 |
| 1.20 | 70.0 | 70.6 | 71.5 |
| 2.40 | 159.3 | 161.9 | 188.4 |
| 3.60 | 197.6 | 197.3 | 213.8 |
| 4.80 | 204.6 | 211.1 | 244.6 |
| 6.00 | 228.9 | 232.0 | 248.7 |
| 7.20 | 164.5 | 171.2 | 175.0 |
| 8.40 | 122.5 | 132.3 | 138.3 |
| 9.60 | 108.2 | 116.1 | 119.0 |

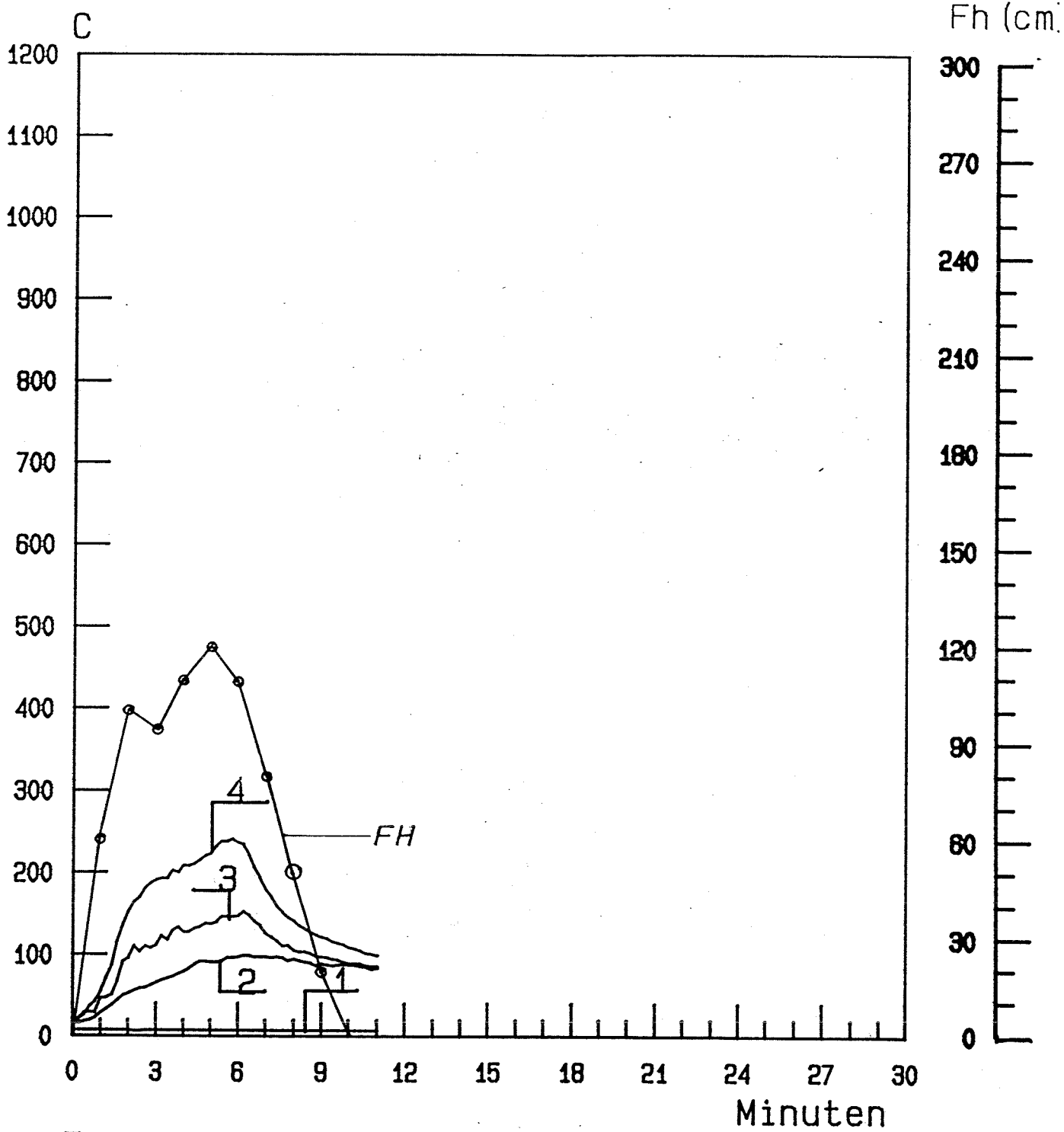
Temperaturen der Meßstellen 28 bis 30 bei Versuch 39.5



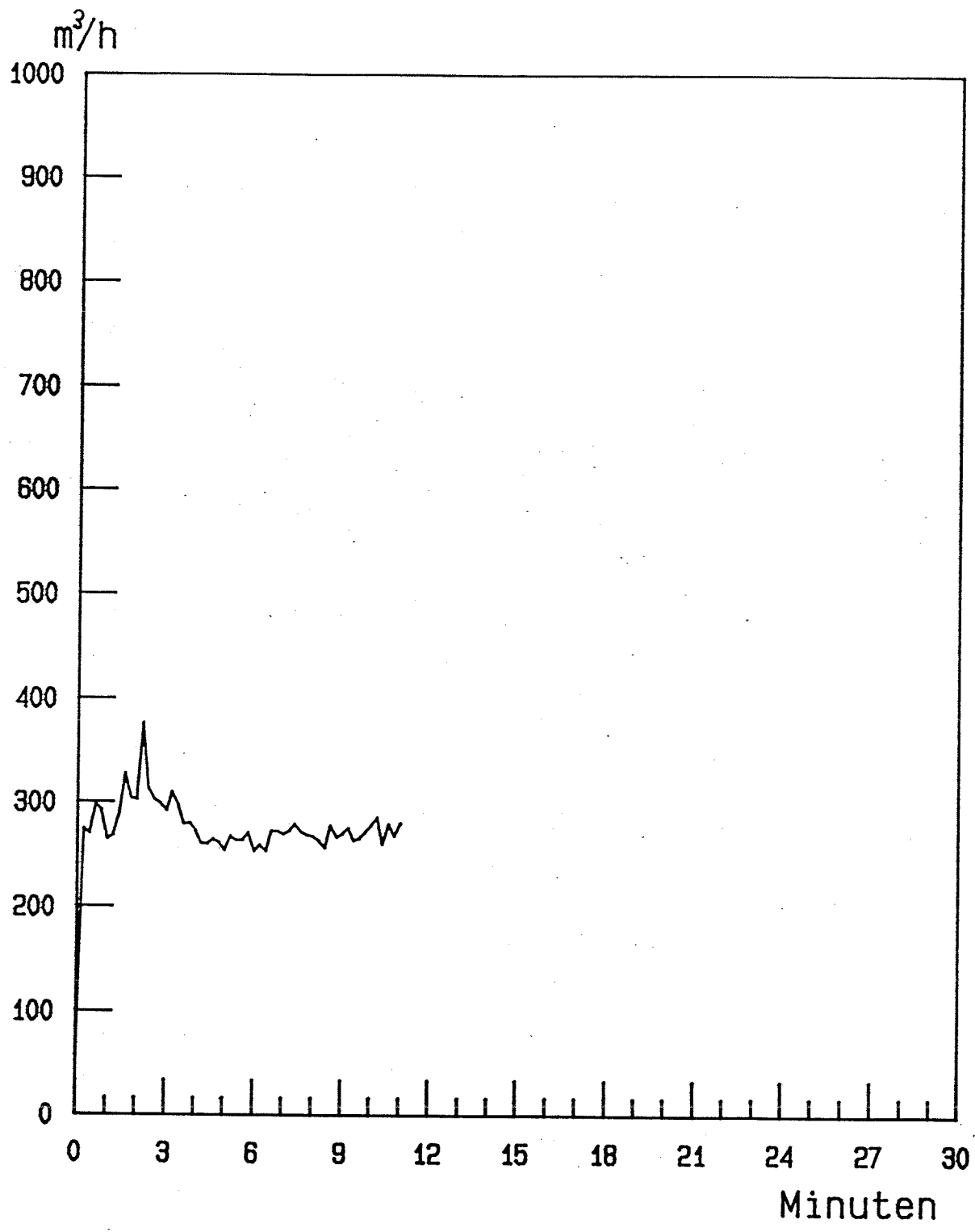
Druckverlauf im Brandraum
bei Versuch 39.5



CO₂, CO, O₂ - Gehalt
bei Versuch 39.5



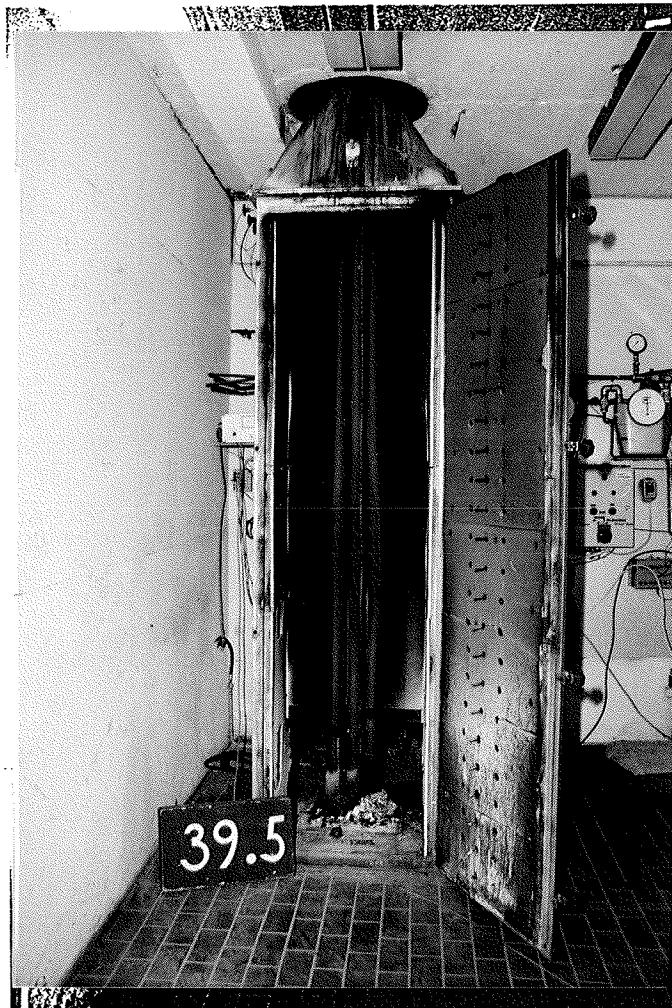
Temperatur und Flammenhoehe
bei Versuch 39.5



Zuluftrate bei Versuch 39.5



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr.: 39.6

Materialbeschreibung

Material Nr. 1.6 : Weichschaum auf synthetischer
Kautschukbasis

Abmessungen

Innendurchmesser/Außendurchmesser: 20 mm/60 mm
Wanddicke : 20 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr.39.6 am 17.03.1989

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|------------------------------------|
| 0' | Zündung des Gasbrenners. |
| 0' 70" | Flammenhöhe ca. 70 cm |
| 2' - 20' | Flammenhöhe zeitweilig 70 - 80 cm. |
| 20' | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte mittlere Restlänge: 1480 mm

Das Probenmaterial ist im Bereich des Knies völlig zerstört.

| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 3.7 | 17.9 | 18.7 | 27.2 | 19.0 | 23.2 | 46.0 | 46.6 | 71.3 | 59.0 | 51.2 | 45.1 | 38.9 | 35.3 |
| 1.20 | 3.6 | 94.8 | 46.6 | 71.9 | 60.2 | 67.7 | 172.4 | 147.3 | 147.0 | 120.1 | 111.9 | 111.5 | 99.6 | 91.9 |
| 2.40 | 3.5 | 96.3 | 59.8 | 89.9 | 78.4 | 75.1 | 131.4 | 159.7 | 179.0 | 158.3 | 148.7 | 137.8 | 124.5 | 113.5 |
| 3.60 | 3.5 | 102.2 | 58.3 | 85.7 | 91.3 | 87.8 | 156.0 | 159.5 | 134.6 | 116.8 | 118.9 | 120.2 | 113.9 | 103.3 |
| 4.80 | 3.5 | 107.3 | 78.7 | 94.9 | 102.1 | 88.1 | 151.2 | 165.6 | 145.3 | 142.4 | 142.7 | 132.8 | 123.3 | 111.8 |
| 6.00 | 3.6 | 108.3 | 76.6 | 106.1 | 102.1 | 85.7 | 149.8 | 172.8 | 162.5 | 153.4 | 142.7 | 130.8 | 125.3 | 113.8 |
| 7.20 | 3.5 | 111.8 | 79.0 | 97.5 | 110.2 | 99.9 | 164.0 | 174.5 | 158.0 | 132.6 | 132.8 | 128.2 | 120.7 | 111.5 |
| 8.40 | 3.6 | 118.6 | 83.1 | 97.3 | 116.0 | 113.2 | 187.3 | 188.0 | 152.0 | 130.8 | 127.7 | 122.4 | 117.0 | 107.5 |
| 9.60 | 3.7 | 117.6 | 93.8 | 105.0 | 120.8 | 102.9 | 149.1 | 175.9 | 165.0 | 151.3 | 147.9 | 137.0 | 126.1 | 115.6 |
| 10.80 | 3.6 | 122.2 | 94.4 | 112.5 | 122.5 | 119.3 | 180.7 | 198.0 | 173.2 | 156.4 | 150.2 | 143.0 | 136.2 | 126.9 |
| 12.00 | 3.7 | 130.6 | 102.2 | 115.0 | 125.8 | 105.2 | 157.9 | 209.5 | 216.8 | 184.8 | 173.6 | 160.5 | 146.5 | 138.6 |
| 13.20 | 3.7 | 135.1 | 113.7 | 121.0 | 135.4 | 116.4 | 160.3 | 207.7 | 193.6 | 163.5 | 154.3 | 150.9 | 141.7 | 134.5 |
| 14.40 | 3.6 | 138.9 | 98.7 | 111.3 | 134.9 | 123.4 | 240.3 | 259.0 | 232.0 | 199.0 | 169.7 | 149.2 | 146.5 | 130.8 |
| 15.60 | 3.7 | 145.1 | 110.3 | 127.8 | 141.4 | 119.1 | 168.2 | 207.4 | 191.5 | 195.3 | 190.4 | 182.1 | 170.1 | 159.6 |
| 16.80 | 3.7 | 147.1 | 118.4 | 127.1 | 144.5 | 122.7 | 188.6 | 240.1 | 214.2 | 197.6 | 193.3 | 180.8 | 170.1 | 156.2 |
| 18.00 | 3.8 | 141.1 | 110.0 | 126.5 | 142.8 | 119.2 | 165.7 | 218.8 | 233.5 | 211.1 | 189.5 | 176.9 | 165.9 | 151.1 |

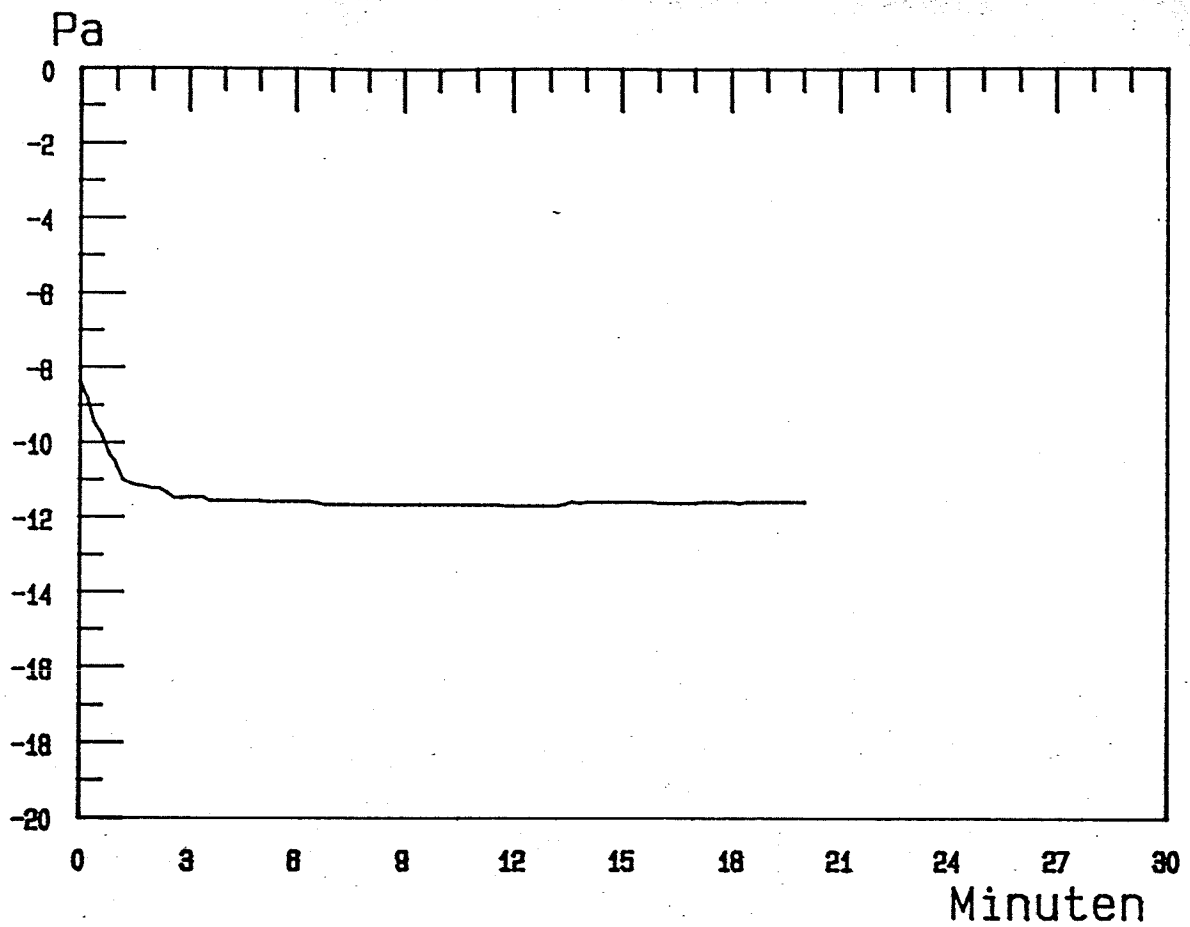
| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 45.7 | 38.8 | 40.1 | 37.2 | 33.6 | 38.3 | 32.3 | 33.8 | 29.9 | 26.0 | 30.3 | 30.5 | 28.8 |
| 1.20 | 96.8 | 98.5 | 90.8 | 86.3 | 77.9 | 90.6 | 83.9 | 93.0 | 94.1 | 81.3 | 93.7 | 91.3 | 79.5 |
| 2.40 | 119.7 | 116.6 | 112.8 | 108.5 | 98.7 | 110.0 | 102.5 | 108.7 | 106.6 | 97.2 | 105.3 | 103.1 | 91.5 |
| 3.60 | 100.6 | 100.5 | 101.9 | 102.1 | 96.2 | 103.9 | 102.0 | 106.6 | 106.9 | 100.2 | 106.0 | 105.7 | 96.3 |
| 4.80 | 116.7 | 115.8 | 115.7 | 112.5 | 105.6 | 114.7 | 108.6 | 112.0 | 111.3 | 104.2 | 108.7 | 105.5 | 96.6 |
| 6.00 | 113.5 | 114.9 | 113.2 | 111.8 | 105.4 | 113.7 | 109.4 | 113.7 | 113.7 | 107.6 | 111.6 | 110.9 | 103.4 |
| 7.20 | 109.9 | 105.7 | 105.1 | 104.5 | 104.6 | 112.6 | 112.1 | 117.1 | 116.0 | 111.4 | 116.0 | 114.6 | 105.8 |
| 8.40 | 103.4 | 104.8 | 106.0 | 106.4 | 105.3 | 113.3 | 112.9 | 117.8 | 117.9 | 113.5 | 117.6 | 116.4 | 109.5 |
| 9.60 | 115.7 | 115.4 | 112.9 | 110.0 | 107.6 | 113.2 | 112.2 | 116.8 | 117.5 | 115.2 | 118.5 | 118.8 | 112.2 |
| 10.80 | 128.2 | 126.5 | 121.7 | 118.9 | 115.9 | 126.7 | 123.4 | 129.8 | 129.5 | 122.8 | 129.4 | 128.0 | 118.3 |
| 12.00 | 138.1 | 137.8 | 133.8 | 132.2 | 124.2 | 134.0 | 126.0 | 130.6 | 129.0 | 122.2 | 125.9 | 125.2 | 118.6 |
| 13.20 | 133.7 | 135.0 | 131.1 | 130.1 | 126.5 | 136.7 | 132.2 | 138.9 | 137.6 | 130.5 | 137.3 | 136.5 | 127.5 |
| 14.40 | 129.0 | 123.9 | 125.8 | 126.4 | 124.8 | 133.3 | 131.7 | 136.9 | 137.9 | 131.2 | 134.2 | 131.9 | 124.7 |
| 15.60 | 156.5 | 155.3 | 150.9 | 147.8 | 141.2 | 151.9 | 146.7 | 152.3 | 151.6 | 142.9 | 147.5 | 145.7 | 135.2 |
| 16.80 | 153.5 | 151.4 | 150.0 | 149.6 | 142.7 | 152.8 | 146.1 | 152.9 | 152.4 | 144.2 | 151.6 | 151.5 | 139.4 |
| 18.00 | 151.3 | 143.6 | 142.2 | 137.3 | 135.1 | 140.2 | 139.8 | 143.5 | 143.5 | 138.3 | 140.4 | 140.5 | 133.3 |

Temperaturen der Meßstellen 1 bis 27 bei Versuch 39.6

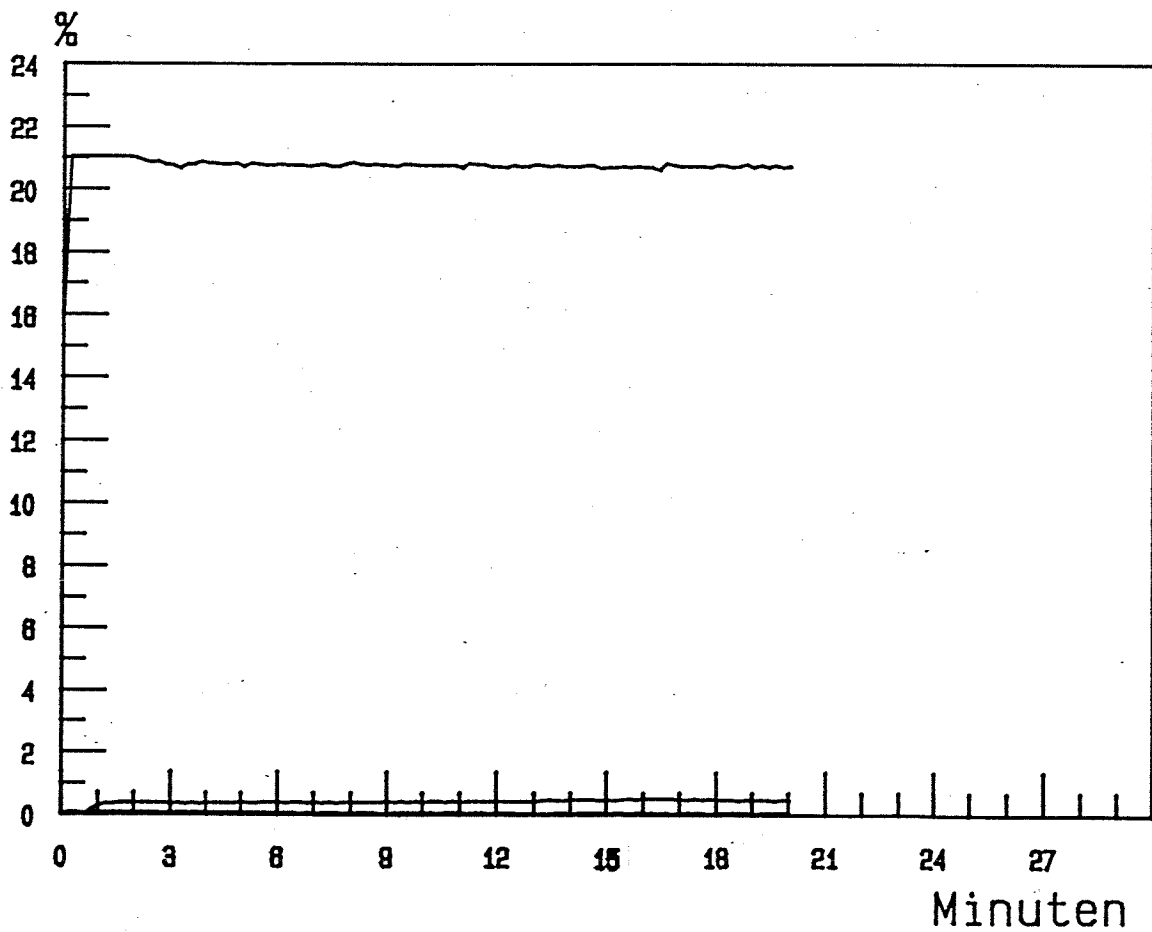
| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|----|----|----|
|-------------------|----|----|----|

| | | | |
|-------|-------|-------|-------|
| 0.00 | 28.2 | 24.0 | 18.6 |
| 1.20 | 85.7 | 85.5 | 82.3 |
| 2.40 | 94.7 | 93.1 | 91.9 |
| 3.60 | 99.5 | 97.7 | 91.3 |
| 4.80 | 100.2 | 101.4 | 96.2 |
| 6.00 | 106.6 | 106.6 | 105.5 |
| 7.20 | 108.6 | 107.9 | 105.3 |
| 8.40 | 112.4 | 113.7 | 108.3 |
| 9.60 | 115.9 | 114.3 | 109.8 |
| 10.80 | 120.7 | 119.4 | 117.1 |
| 12.00 | 120.9 | 121.1 | 114.8 |
| 13.20 | 130.6 | 130.9 | 125.0 |
| 14.40 | 128.2 | 131.8 | 124.5 |
| 15.60 | 136.1 | 141.1 | 132.5 |
| 16.80 | 143.7 | 143.9 | 131.7 |
| 18.00 | 136.0 | 136.0 | 129.4 |

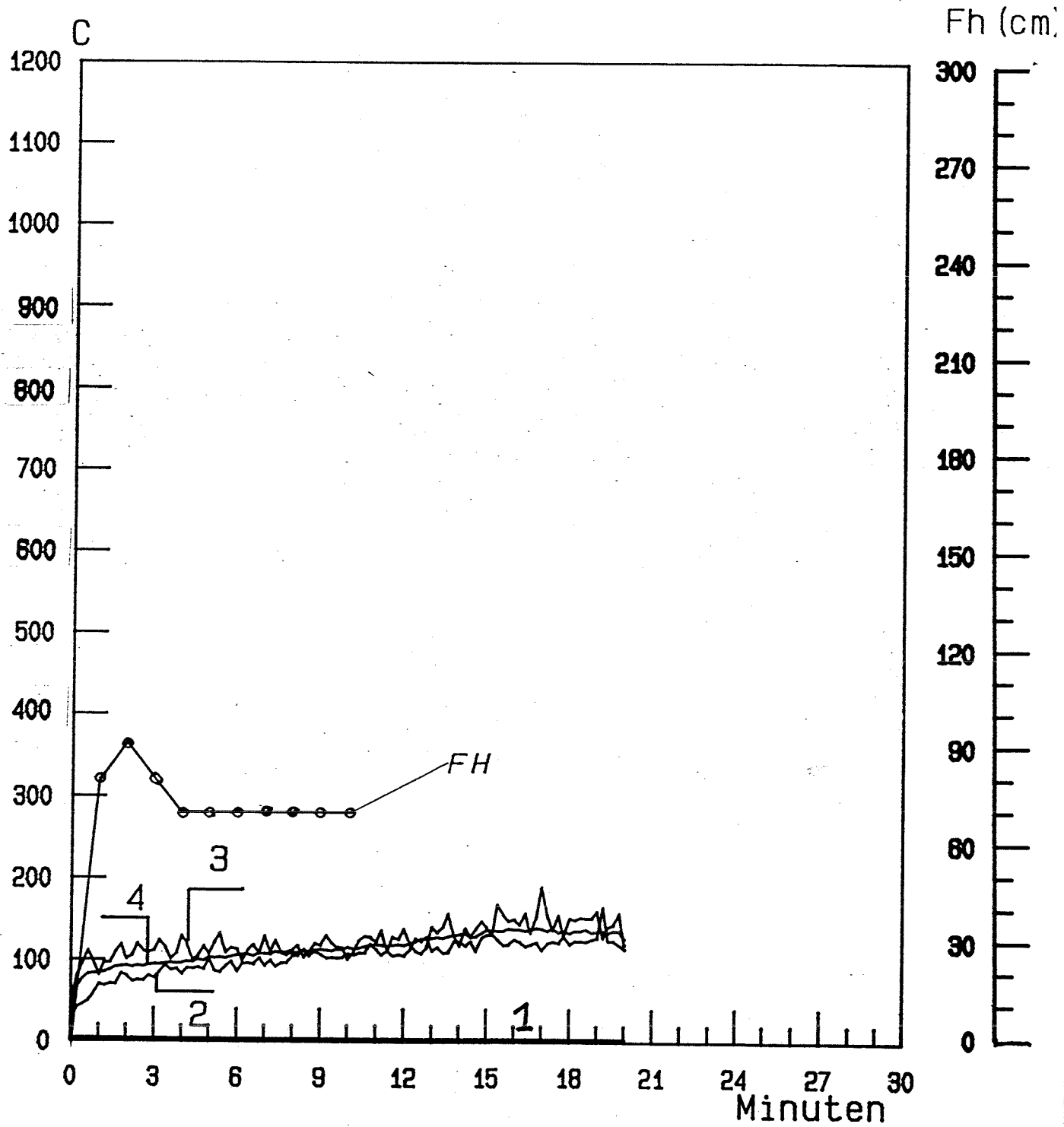
Temperaturen der Meßstellen 28 bis 30 bei Versuch 39.6



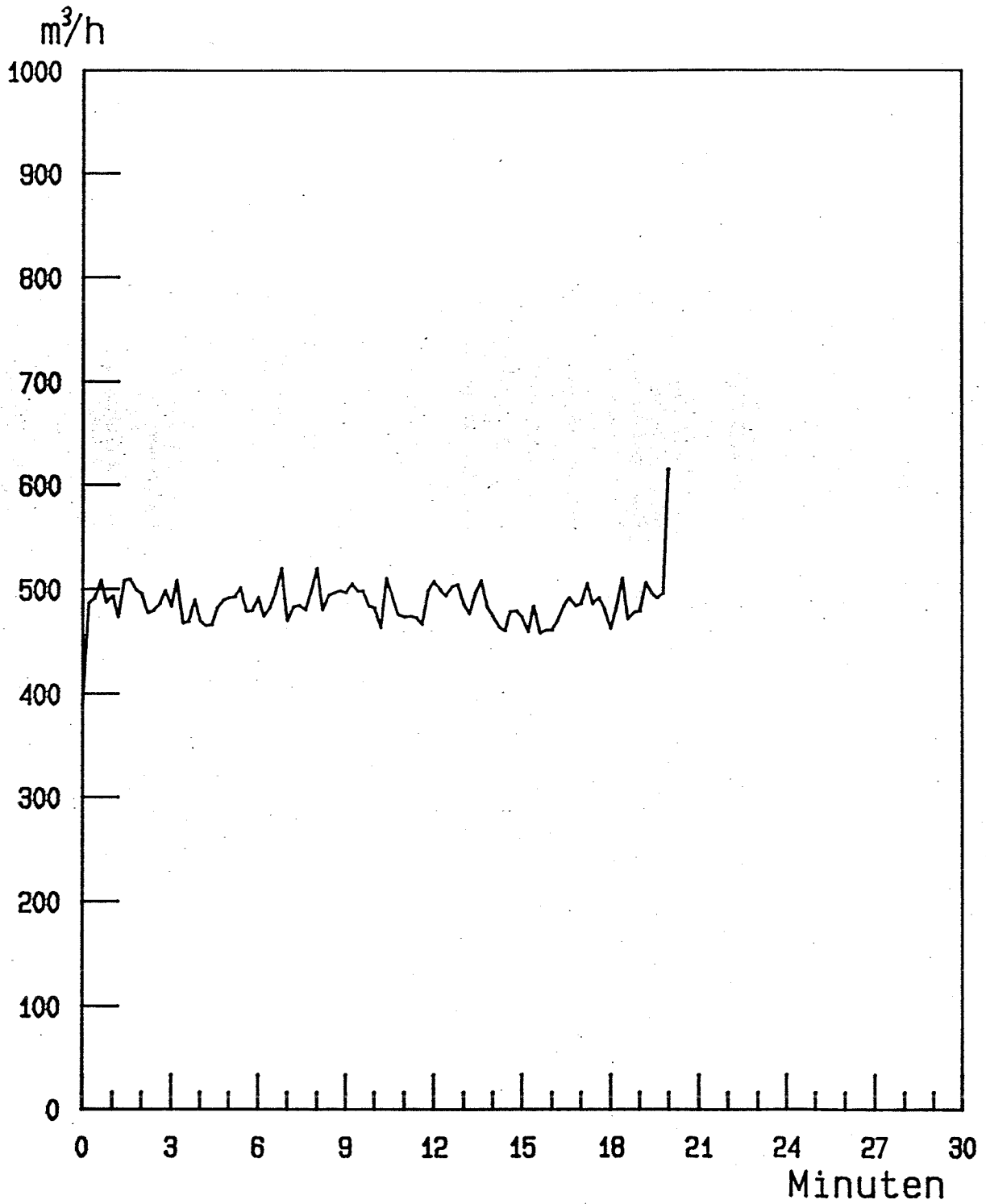
Druckverlauf im Brandraum
bei Versuch 39.6



CO₂, CO, O₂ - Gehalt
bei Versuch 39.6



Temperatur und Flammenhoehe
bei Versuch 39.6



Zuluftrate bei Versuch 39.6



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 40.1

Materialbeschreibung

Material Nr. 7.1 : ISOVER MIFA Alukaschiert

Abmessungen

Innendurchmesser/Außendurchmesser: 61 mm/122 mm

Wanddicke : 30,5 mm

Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 40.1 am 13.10.1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung der Holzkrippe (2 kg) durch zwei mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 6' 00" | Holzkippe brennt vollständig. Das Material im Bereich des Knies über der Holzkippe zeigt keine Materialveränderung. |
| 7' 00" | Material brennt nicht mit. |
| 9' 00" | Flammenhöhe geht zurück. |
| 10' 00" | Flammenhöhe stark abnehmend. |
| 10' 30" | Flammenhöhe 0 cm. |
| 10' 30" - 21' | Holzstapel ausgebrannt. |
| 22' 00" | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge :

Probe 1: 2250 mm

Probe 2: 2250 mm

Probe 3: 2250 mm

Mittelwert = 2250 mm

Im horizontalen Bereich ist das Probenmaterial vollständig zerstört. Im vertikalen Bereich ist das Material bis zur mittleren Restlänge von 2250 mm geschmolzen und karbonisiert.

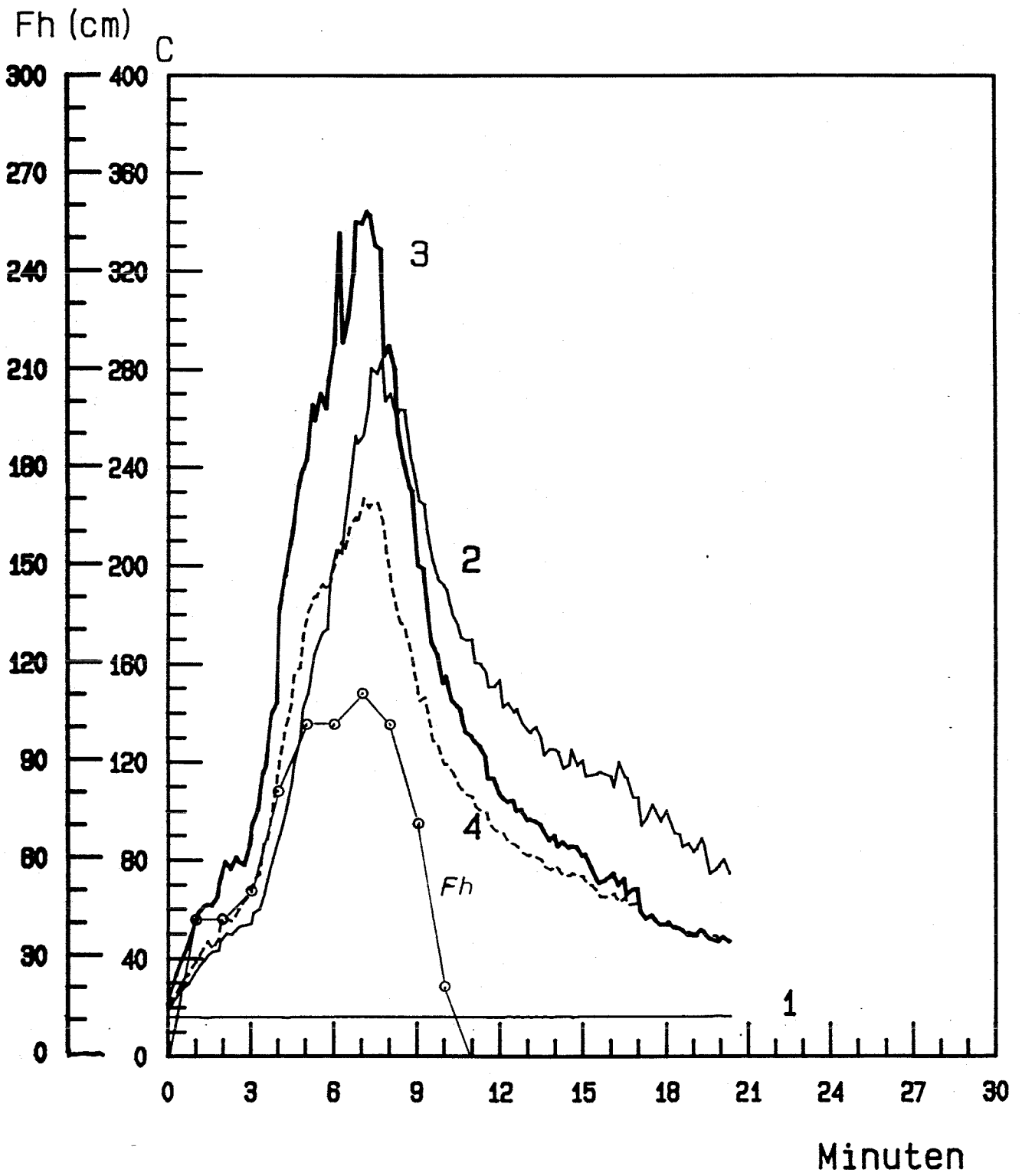
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 15.9 | 21.1 | 19.3 | 21.1 | 18.2 | 18.6 | 19.1 | 19.8 | 19.8 | 20.1 | 20.7 | 20.8 | 21.0 | 21.1 |
| 1.45 | 15.6 | 38.5 | 23.3 | 23.9 | 39.5 | 40.7 | 49.3 | 50.7 | 60.7 | 71.0 | 63.4 | 63.0 | 52.8 | 56.4 |
| 2.45 | 15.7 | 51.0 | 25.7 | 28.2 | 48.0 | 51.9 | 64.2 | 74.6 | 88.3 | 84.8 | 80.6 | 76.3 | 68.3 | 71.9 |
| 3.45 | 15.7 | 76.6 | 30.7 | 56.0 | 64.7 | 66.1 | 90.3 | 124.7 | 162.8 | 137.1 | 115.5 | 110.9 | 97.5 | 101.3 |
| 4.45 | 15.8 | 127.4 | 48.9 | 97.2 | 86.3 | 112.0 | 156.9 | 182.3 | 228.8 | 269.0 | 242.3 | 225.0 | 178.6 | 186.5 |
| 5.45 | 15.8 | 168.4 | 59.9 | 115.3 | 120.8 | 166.1 | 235.0 | 274.6 | 323.2 | 352.8 | 320.0 | 294.0 | 259.5 | 245.5 |
| 6.45 | 15.8 | 186.2 | 78.0 | 124.6 | 164.4 | 216.1 | 279.7 | 334.3 | 394.9 | 433.0 | 379.7 | 345.3 | 302.0 | 280.8 |
| 7.45 | 15.8 | 201.0 | 91.2 | 124.8 | 205.2 | 280.6 | 369.3 | 422.0 | 453.7 | 460.6 | 417.7 | 392.6 | 356.7 | 335.6 |
| 8.45 | 15.8 | 171.5 | 107.7 | 97.8 | 206.8 | 263.5 | 329.2 | 361.1 | 361.7 | 349.8 | 315.1 | 289.1 | 278.0 | 260.4 |
| 9.45 | 15.9 | 140.0 | 97.5 | 78.6 | 176.9 | 213.7 | 243.7 | 264.4 | 240.4 | 234.5 | 215.6 | 205.0 | 209.9 | 195.7 |
| 10.45 | 15.9 | 113.9 | 92.2 | 70.7 | 170.5 | 175.6 | 195.8 | 196.9 | 167.7 | 159.1 | 157.7 | 153.6 | 160.0 | 152.6 |
| 11.45 | 15.9 | 101.5 | 86.7 | 64.5 | 146.6 | 156.0 | 173.5 | 175.0 | 145.9 | 134.1 | 132.5 | 130.8 | 135.2 | 129.2 |
| 12.45 | 15.9 | 90.9 | 83.8 | 59.0 | 133.2 | 140.0 | 155.5 | 146.7 | 118.7 | 109.7 | 108.5 | 105.9 | 111.8 | 108.0 |
| 13.45 | 15.9 | 84.1 | 77.9 | 54.3 | 122.9 | 129.5 | 141.5 | 135.4 | 118.3 | 102.6 | 98.7 | 95.8 | 100.3 | 97.3 |
| 14.45 | 16.0 | 80.3 | 77.7 | 55.8 | 107.8 | 118.5 | 130.7 | 120.0 | 91.4 | 83.9 | 85.4 | 84.6 | 89.8 | 87.6 |
| 15.45 | 16.0 | 75.6 | 74.9 | 53.8 | 102.8 | 114.7 | 132.1 | 119.8 | 94.4 | 78.7 | 74.1 | 72.4 | 80.4 | 77.3 |
| 16.45 | 16.1 | 67.1 | 70.6 | 49.4 | 107.3 | 113.5 | 123.9 | 115.3 | 93.1 | 83.4 | 78.0 | 73.5 | 76.5 | 74.0 |
| 17.45 | 16.1 | 64.0 | 70.9 | 54.7 | 91.5 | 102.3 | 104.9 | 93.2 | 68.6 | 56.8 | 59.8 | 59.1 | 65.5 | 61.7 |
| 18.45 | 16.1 | 59.2 | 70.8 | 56.7 | 81.2 | 90.1 | 91.3 | 80.3 | 59.0 | 51.8 | 57.0 | 54.9 | 59.7 | 56.0 |
| 19.45 | 16.2 | 56.7 | 64.8 | 46.5 | 74.8 | 85.3 | 89.6 | 78.7 | 61.1 | 54.4 | 54.3 | 52.2 | 55.9 | 53.1 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 21.2 | 21.2 | 21.2 | 21.2 | 21.2 | 21.2 | 21.3 | 21.2 | 21.2 | 21.1 | 21.1 | 21.1 | 21.1 |
| 1.45 | 61.7 | 63.5 | 61.9 | 60.2 | 57.7 | 59.0 | 52.7 | 56.6 | 55.3 | 53.4 | 54.3 | 53.8 | 50.0 |
| 2.45 | 81.5 | 83.7 | 81.5 | 77.3 | 74.1 | 76.0 | 68.6 | 70.6 | 68.9 | 67.3 | 67.8 | 67.5 | 62.7 |
| 3.45 | 115.6 | 116.5 | 111.0 | 103.4 | 99.2 | 108.1 | 95.7 | 98.5 | 100.5 | 97.8 | 100.9 | 100.9 | 92.7 |
| 4.45 | 209.3 | 213.5 | 203.4 | 191.3 | 185.8 | 194.2 | 169.6 | 177.3 | 174.2 | 166.2 | 169.5 | 166.9 | 150.7 |
| 5.45 | 259.3 | 262.2 | 260.1 | 245.6 | 237.2 | 238.3 | 221.4 | 228.4 | 225.2 | 218.0 | 218.1 | 217.5 | 198.5 |
| 6.45 | 291.3 | 296.4 | 289.1 | 275.4 | 266.0 | 263.5 | 249.5 | 251.7 | 246.0 | 237.9 | 235.4 | 230.8 | 215.8 |
| 7.45 | 343.1 | 336.1 | 322.6 | 302.3 | 293.0 | 289.0 | 272.1 | 275.3 | 271.6 | 261.7 | 259.6 | 258.3 | 237.4 |
| 8.45 | 254.2 | 248.1 | 241.4 | 229.7 | 224.9 | 214.7 | 211.6 | 202.6 | 199.9 | 198.9 | 193.8 | 193.9 | 187.2 |
| 9.45 | 186.8 | 183.4 | 182.4 | 175.1 | 173.4 | 166.7 | 167.9 | 160.8 | 159.1 | 157.2 | 153.1 | 152.7 | 148.6 |
| 10.45 | 142.8 | 137.8 | 136.1 | 132.6 | 131.6 | 124.6 | 126.7 | 118.7 | 118.0 | 119.1 | 114.9 | 115.5 | 115.1 |
| 11.45 | 122.1 | 119.7 | 118.8 | 115.8 | 114.5 | 110.3 | 111.1 | 106.2 | 106.0 | 106.4 | 103.5 | 103.6 | 103.0 |
| 12.45 | 104.4 | 101.3 | 100.8 | 98.6 | 97.8 | 94.4 | 95.1 | 91.2 | 91.2 | 91.2 | 88.4 | 88.5 | 88.7 |
| 13.45 | 94.6 | 93.5 | 93.1 | 91.4 | 90.3 | 88.9 | 87.6 | 83.9 | 83.4 | 83.8 | 82.5 | 82.8 | 81.9 |
| 14.45 | 84.9 | 82.1 | 81.2 | 78.8 | 78.6 | 75.0 | 76.5 | 74.3 | 73.3 | 74.1 | 72.0 | 72.6 | 72.5 |
| 15.45 | 72.5 | 70.2 | 71.3 | 70.8 | 71.8 | 68.2 | 70.4 | 68.2 | 67.5 | 67.9 | 65.3 | 66.0 | 66.7 |
| 16.45 | 72.5 | 71.6 | 71.6 | 70.5 | 69.9 | 69.2 | 68.6 | 67.2 | 67.5 | 67.2 | 66.3 | 66.5 | 66.1 |
| 17.45 | 57.6 | 55.5 | 56.3 | 56.0 | 56.8 | 54.9 | 57.4 | 54.1 | 54.5 | 55.5 | 53.7 | 54.2 | 55.5 |
| 18.45 | 52.2 | 50.0 | 50.2 | 50.1 | 50.7 | 49.0 | 51.4 | 48.8 | 49.1 | 50.2 | 48.6 | 49.1 | 50.3 |
| 19.45 | 50.8 | 49.0 | 48.9 | 48.8 | 49.1 | 47.8 | 49.0 | 47.3 | 47.8 | 48.4 | 47.4 | 48.1 | 48.4 |

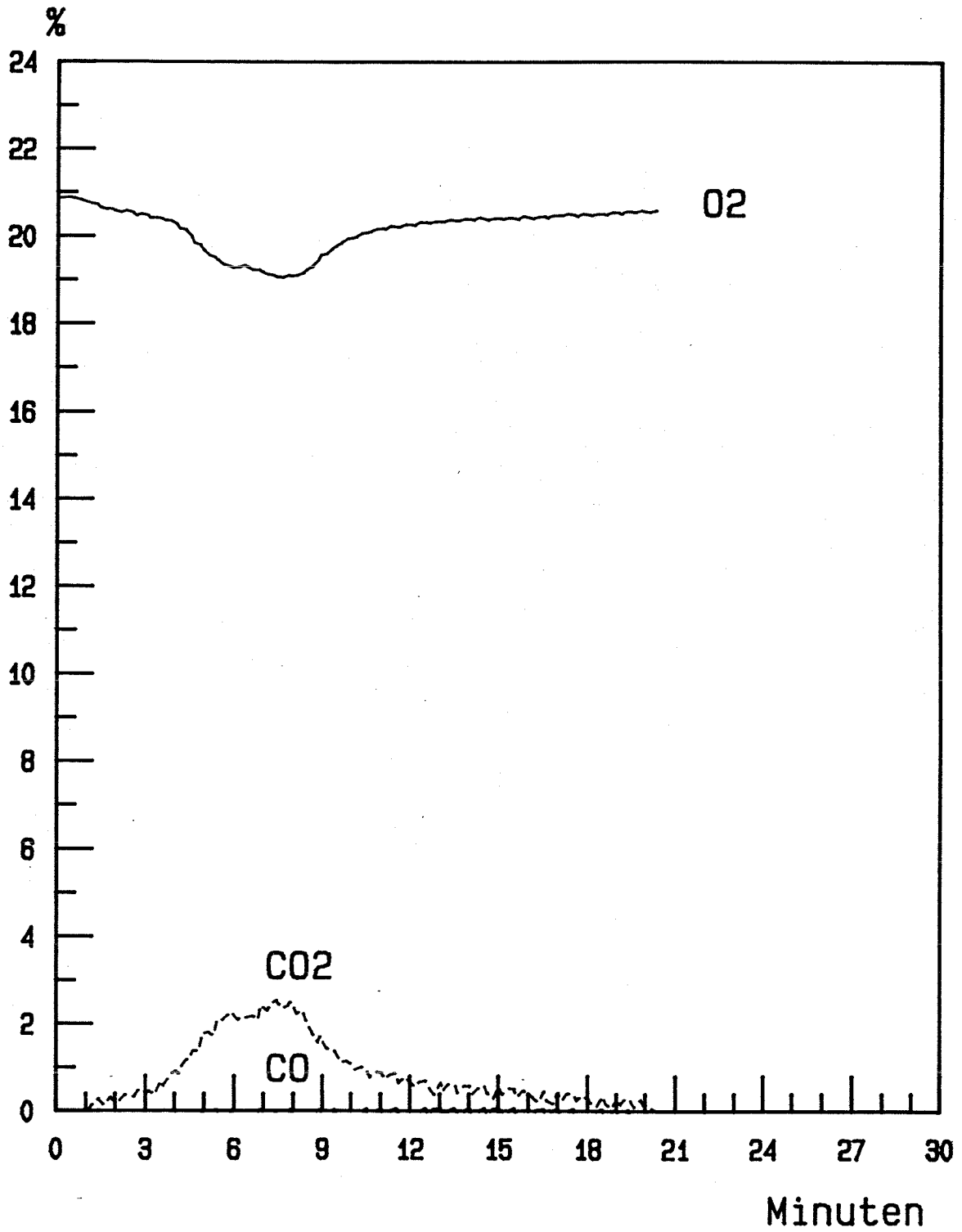
Temperaturen der Meßstellen 1 bis 27 bei Versuch 40.1

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 21.1 | 21.1 | 21.0 |
| 1.45 | 51.6 | 50.2 | 37.9 |
| 2.45 | 64.0 | 63.8 | 48.3 |
| 3.45 | 95.8 | 91.6 | 75.6 |
| 4.45 | 156.0 | 147.8 | 130.7 |
| 5.45 | 201.7 | 188.8 | 171.4 |
| 6.45 | 217.4 | 209.0 | 190.7 |
| 7.45 | 244.3 | 230.6 | 200.5 |
| 8.45 | 187.9 | 182.3 | 161.0 |
| 9.45 | 147.6 | 147.5 | 126.7 |
| 10.45 | 113.7 | 115.2 | 101.8 |
| 11.45 | 102.4 | 103.9 | 90.6 |
| 12.45 | 88.3 | 90.6 | 80.0 |
| 13.45 | 81.5 | 83.1 | 75.4 |
| 14.45 | 72.5 | 77.2 | 70.6 |
| 15.45 | 66.3 | 70.6 | 64.8 |
| 16.45 | 66.1 | 67.4 | 60.1 |
| 17.45 | 54.9 | 57.9 | 57.0 |
| 18.45 | 49.9 | 52.0 | 53.5 |
| 19.45 | 48.3 | 50.6 | 49.0 |

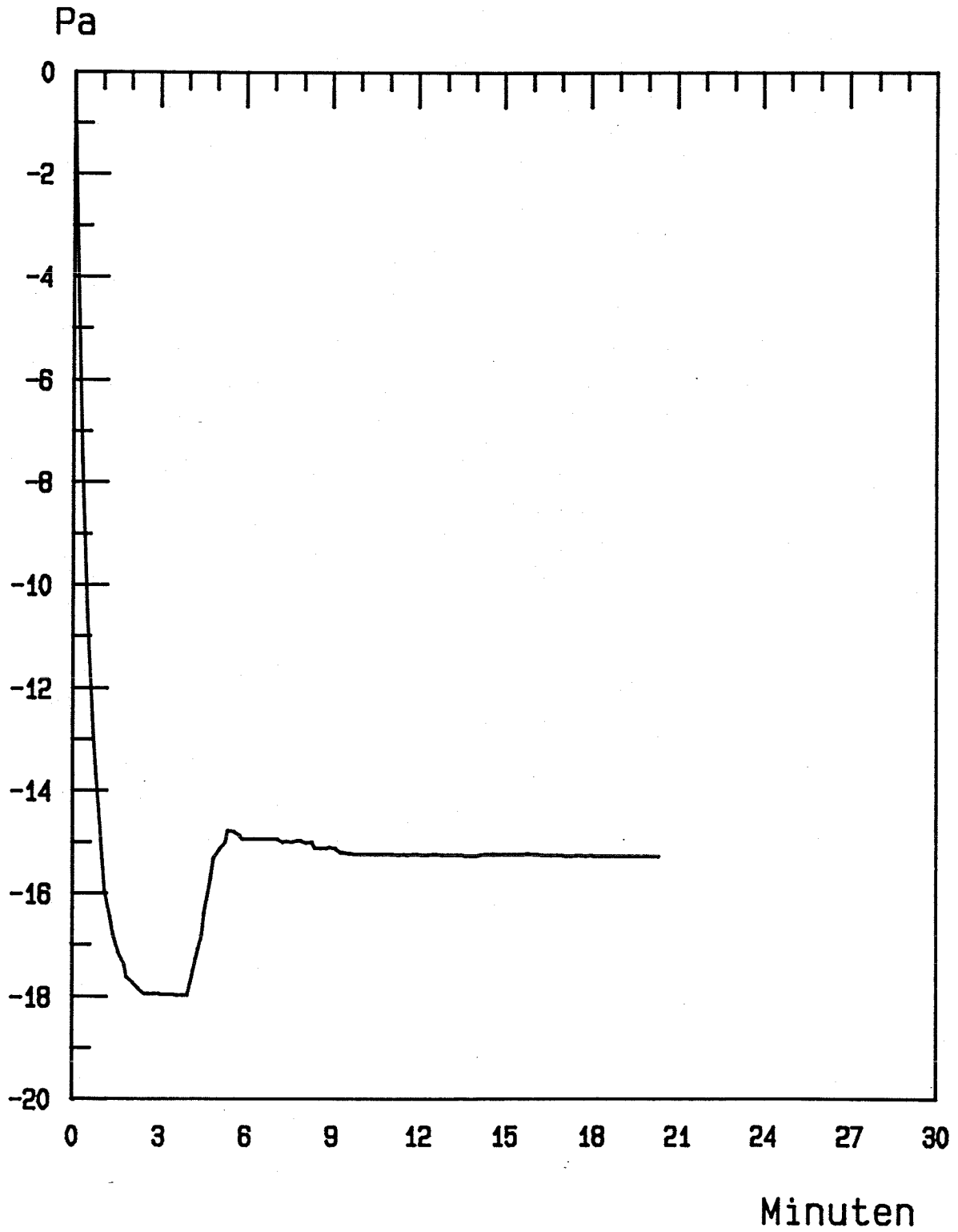
Temperaturen der Meßstellen 28 bis 30 bei Versuch 40.1



Temperatur und Flammenhoehe bei Versuch 40.1



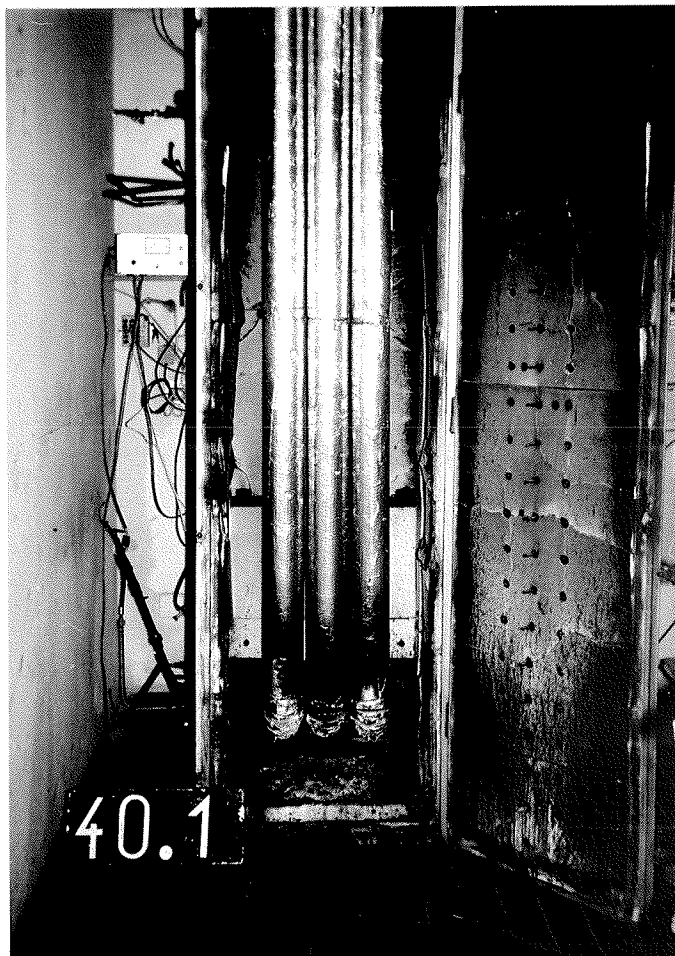
CO₂, CO, O₂-Gehalt bei Versuch 40.1



Druckverlauf im Brandraum bei Versuch 40.1



Versuchsanordnung vor
dem Brandversuch



Versuchsanordnung nach
dem Brandversuch

Versuch Nr. : 40.2

Materialbeschreibung

Material Nr. 7.1 : ISOVER MIFA Alukaschiert

Abmessungen

Innendurchmesser/Außendurchmesser: 61 mm/122 mm

Wanddicke : 30,5 mm

Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 40.2 am 19.10.1988

Zeit nach
Versuchsbeginn

Beobachtungen

| | | |
|-----|-----|---|
| 0' | | Zündung des Gasbrenners. |
| 5' | 00" | Am Material im Bereich des Knies ist keine Veränderung festzustellen. |
| 10' | 00" | Leichte Verformung im Bereich des Knies. |
| 14' | 00" | Im Bereich des Knies ist die Alukaschierung aufgeplatzt. |
| 20' | 00" | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge :

Probe 1: 2250 mm

Probe 2: 2050 mm

Probe 3: 2150 mm

Mittelwert = 2150 mm

Im Bereich des Knies über dem Brenner ist das Probenmaterial angeschmolzen und teilweise verbrannt.

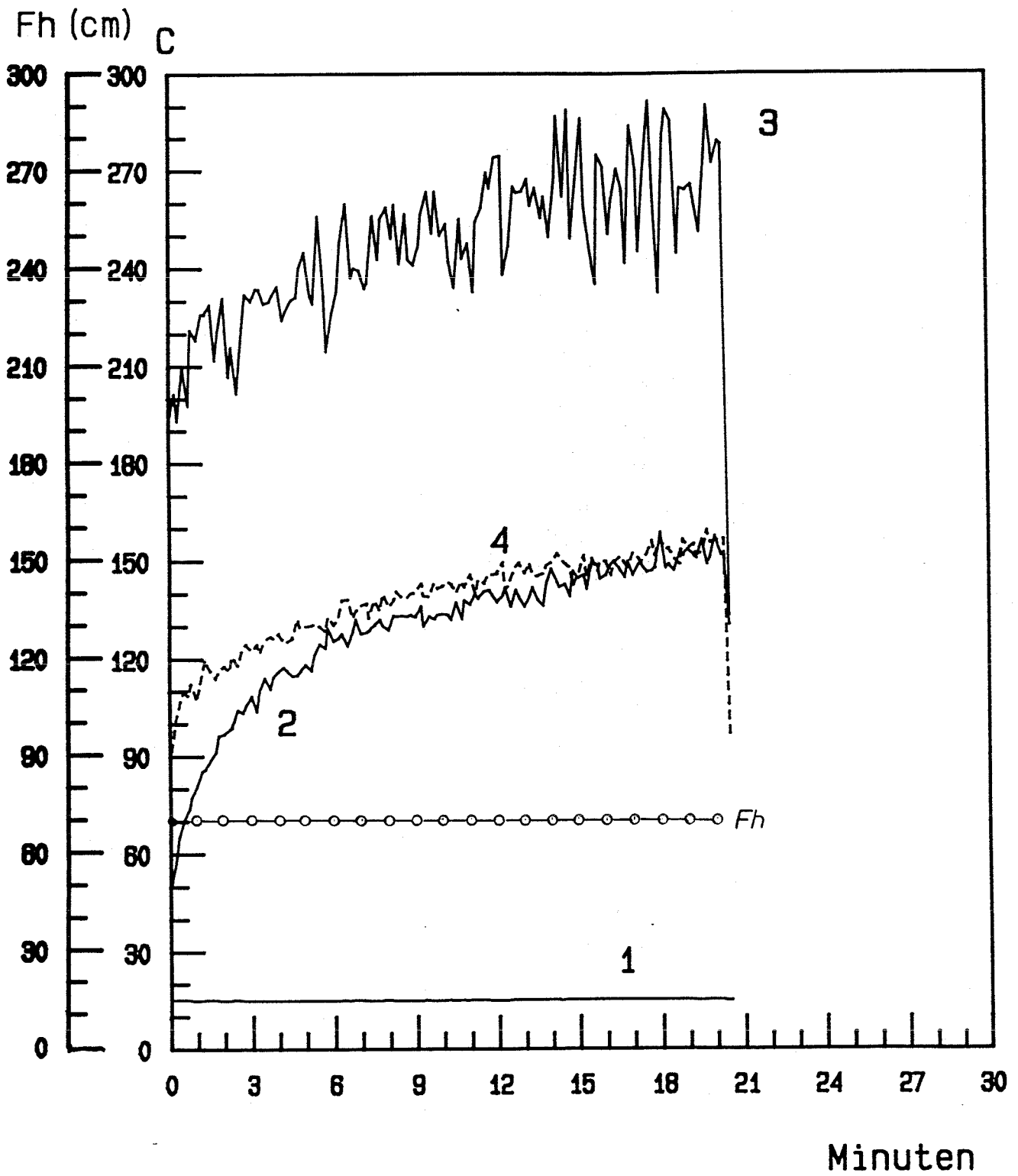
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 15.1 | 51.6 | 24.4 | 42.4 | 38.7 | 48.2 | 71.2 | 106.1 | 176.4 | 194.3 | 171.6 | 175.1 | 148.4 | 158.8 |
| 1.00 | 15.0 | 86.1 | 30.7 | 44.8 | 71.3 | 81.0 | 113.8 | 130.3 | 171.7 | 211.4 | 214.3 | 220.8 | 198.1 | 201.8 |
| 2.00 | 15.0 | 96.4 | 39.2 | 54.9 | 92.9 | 96.8 | 129.1 | 145.1 | 168.0 | 216.1 | 229.1 | 232.5 | 217.5 | 216.3 |
| 3.00 | 14.9 | 99.7 | 43.1 | 58.2 | 100.1 | 108.5 | 137.7 | 150.6 | 174.8 | 202.7 | 206.3 | 231.9 | 218.2 | 221.3 |
| 4.00 | 15.0 | 106.3 | 52.2 | 61.8 | 109.9 | 116.1 | 150.1 | 163.9 | 179.4 | 210.0 | 219.4 | 234.3 | 222.5 | 225.5 |
| 5.00 | 15.1 | 109.3 | 56.6 | 64.4 | 112.5 | 118.4 | 155.3 | 177.4 | 189.3 | 242.0 | 250.1 | 266.9 | 242.8 | 239.0 |
| 6.00 | 15.0 | 111.4 | 63.6 | 68.8 | 121.6 | 125.5 | 161.4 | 177.9 | 192.2 | 213.2 | 233.3 | 235.2 | 224.1 | 224.4 |
| 7.00 | 15.1 | 118.8 | 75.8 | 77.9 | 121.0 | 127.7 | 170.4 | 222.2 | 228.6 | 242.2 | 244.8 | 252.9 | 240.5 | 232.3 |
| 8.00 | 15.1 | 117.3 | 79.9 | 74.0 | 124.6 | 128.8 | 167.9 | 187.8 | 195.3 | 229.4 | 249.5 | 258.1 | 247.1 | 254.4 |
| 9.00 | 15.0 | 120.2 | 83.9 | 71.5 | 124.9 | 132.9 | 177.8 | 203.2 | 234.4 | 246.3 | 244.2 | 252.5 | 242.1 | 239.3 |
| 10.00 | 15.0 | 125.1 | 79.1 | 68.9 | 128.7 | 133.7 | 170.4 | 197.8 | 206.7 | 240.9 | 245.9 | 262.3 | 250.8 | 248.3 |
| 11.00 | 15.1 | 122.6 | 83.2 | 74.4 | 131.9 | 136.6 | 172.4 | 191.7 | 206.5 | 235.2 | 247.8 | 261.6 | 244.2 | 242.5 |
| 12.00 | 15.1 | 125.2 | 86.8 | 79.3 | 131.0 | 137.4 | 186.3 | 241.0 | 253.8 | 269.0 | 268.7 | 273.0 | 257.9 | 265.5 |
| 13.00 | 15.1 | 128.7 | 81.8 | 69.4 | 131.8 | 135.9 | 174.4 | 204.4 | 221.6 | 261.8 | 267.9 | 288.5 | 263.2 | 264.1 |
| 14.00 | 15.1 | 125.7 | 86.8 | 79.0 | 150.3 | 147.6 | 185.0 | 206.4 | 217.3 | 236.5 | 249.3 | 254.6 | 246.7 | 248.8 |
| 15.00 | 15.2 | 125.7 | 98.4 | 88.5 | 142.2 | 144.7 | 192.4 | 215.6 | 214.1 | 244.3 | 248.6 | 265.3 | 255.2 | 258.2 |
| 16.00 | 15.2 | 129.8 | 92.1 | 75.2 | 137.1 | 145.6 | 185.3 | 208.8 | 216.3 | 237.8 | 252.0 | 268.5 | 259.2 | 267.3 |
| 17.00 | 15.2 | 131.4 | 93.3 | 84.5 | 147.1 | 145.6 | 205.0 | 253.6 | 241.3 | 248.5 | 251.9 | 268.9 | 265.0 | 272.2 |
| 18.00 | 15.2 | 133.2 | 96.9 | 82.7 | 164.3 | 158.6 | 182.2 | 201.1 | 193.0 | 222.3 | 228.7 | 240.5 | 243.1 | 239.4 |
| 19.00 | 15.1 | 132.2 | 100.6 | 92.4 | 157.9 | 153.5 | 191.5 | 219.8 | 236.9 | 266.7 | 260.3 | 274.2 | 264.1 | 261.8 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 192.5 | 195.9 | 176.8 | 156.8 | 114.8 | 158.1 | 120.2 | 137.9 | 141.9 | 117.9 | 136.1 | 127.7 | 106.9 |
| 1.00 | 217.9 | 216.1 | 203.2 | 187.9 | 163.3 | 170.8 | 149.1 | 156.9 | 149.6 | 138.1 | 138.2 | 132.5 | 116.9 |
| 2.00 | 230.8 | 228.6 | 215.6 | 200.9 | 175.4 | 184.8 | 165.1 | 168.2 | 163.5 | 151.3 | 153.8 | 145.0 | 131.3 |
| 3.00 | 229.7 | 221.4 | 207.7 | 195.3 | 178.7 | 178.2 | 165.5 | 166.4 | 161.6 | 155.6 | 153.0 | 148.2 | 136.6 |
| 4.00 | 234.5 | 230.2 | 218.7 | 205.6 | 187.4 | 186.0 | 174.1 | 175.7 | 171.3 | 163.9 | 163.9 | 157.4 | 144.9 |
| 5.00 | 245.0 | 238.3 | 226.9 | 211.0 | 190.6 | 190.3 | 176.0 | 174.7 | 167.0 | 159.4 | 157.2 | 152.3 | 143.8 |
| 6.00 | 226.3 | 222.1 | 213.7 | 202.2 | 189.3 | 185.8 | 175.6 | 175.6 | 169.0 | 160.5 | 155.8 | 150.5 | 140.4 |
| 7.00 | 239.4 | 231.5 | 221.0 | 207.5 | 190.3 | 188.7 | 182.3 | 182.4 | 178.4 | 170.3 | 169.3 | 162.1 | 152.5 |
| 8.00 | 258.6 | 254.2 | 240.2 | 222.5 | 204.2 | 199.7 | 187.5 | 187.3 | 178.9 | 170.6 | 165.9 | 159.0 | 149.4 |
| 9.00 | 240.9 | 238.0 | 228.0 | 214.4 | 201.8 | 199.3 | 188.7 | 190.1 | 185.4 | 175.6 | 173.4 | 169.4 | 158.2 |
| 10.00 | 250.0 | 245.0 | 230.0 | 218.5 | 203.9 | 201.5 | 190.6 | 187.8 | 183.5 | 175.8 | 174.8 | 169.3 | 159.9 |
| 11.00 | 247.6 | 244.8 | 233.2 | 219.9 | 203.9 | 204.3 | 192.8 | 193.3 | 191.3 | 179.1 | 179.2 | 174.3 | 163.8 |
| 12.00 | 274.0 | 272.2 | 257.4 | 235.4 | 214.7 | 218.7 | 202.3 | 201.3 | 195.1 | 184.4 | 181.4 | 174.6 | 164.3 |
| 13.00 | 263.6 | 256.5 | 241.0 | 223.3 | 204.9 | 203.8 | 192.6 | 189.3 | 183.4 | 176.3 | 171.7 | 166.8 | 158.7 |
| 14.00 | 249.7 | 255.1 | 247.8 | 238.6 | 218.7 | 216.7 | 201.4 | 202.5 | 196.3 | 188.9 | 188.0 | 180.7 | 169.9 |
| 15.00 | 265.8 | 257.8 | 240.4 | 228.5 | 212.3 | 212.5 | 202.1 | 197.3 | 194.5 | 185.1 | 183.5 | 176.2 | 165.3 |
| 16.00 | 270.9 | 267.8 | 255.5 | 239.9 | 221.9 | 225.3 | 206.7 | 205.5 | 198.7 | 186.3 | 182.6 | 176.4 | 165.0 |
| 17.00 | 284.0 | 271.7 | 257.3 | 237.4 | 216.6 | 218.0 | 202.3 | 203.1 | 195.0 | 185.7 | 186.4 | 180.6 | 169.3 |
| 18.00 | 232.5 | 233.5 | 227.2 | 220.2 | 210.7 | 207.4 | 198.7 | 197.4 | 193.6 | 188.2 | 187.7 | 182.0 | 173.5 |
| 19.00 | 264.1 | 262.2 | 247.6 | 228.4 | 213.6 | 216.0 | 203.5 | 201.3 | 197.4 | 190.7 | 187.6 | 178.3 | 170.9 |

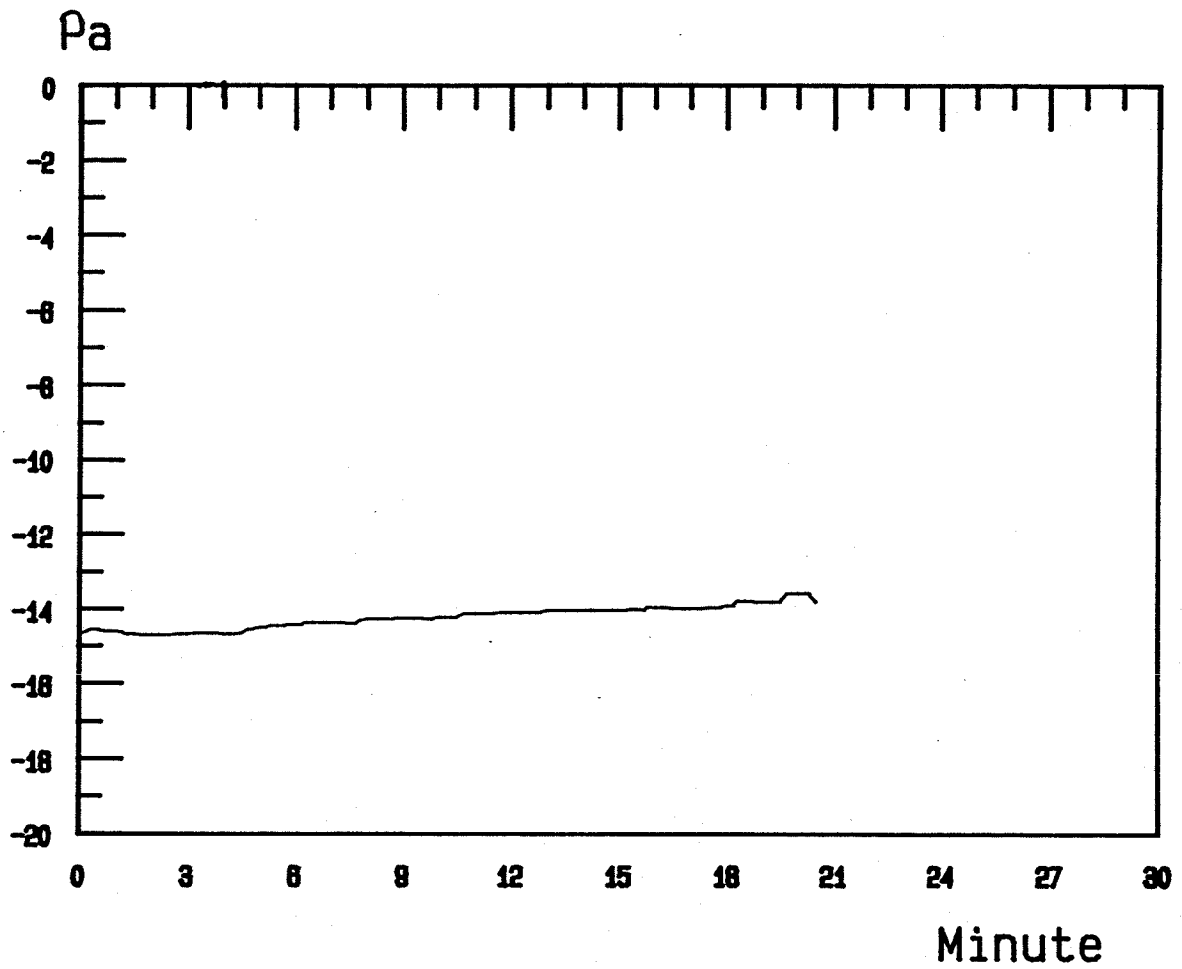
Temperaturen der Meßstellen 1 bis 27 bei Versuch 40.2

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 112.5 | 89.5 | 59.5 |
| 1.00 | 120.3 | 107.5 | 93.0 |
| 2.00 | 132.4 | 118.3 | 102.1 |
| 3.00 | 138.2 | 122.3 | 106.5 |
| 4.00 | 144.8 | 129.1 | 109.2 |
| 5.00 | 145.0 | 129.0 | 115.6 |
| 6.00 | 141.2 | 132.9 | 117.0 |
| 7.00 | 152.3 | 136.0 | 121.1 |
| 8.00 | 149.1 | 136.5 | 122.0 |
| 9.00 | 156.6 | 140.8 | 124.2 |
| 10.00 | 159.2 | 143.7 | 123.6 |
| 11.00 | 163.6 | 146.7 | 127.0 |
| 12.00 | 162.1 | 144.6 | 131.5 |
| 13.00 | 158.8 | 147.5 | 132.0 |
| 14.00 | 168.9 | 149.9 | 129.0 |
| 15.00 | 162.9 | 148.9 | 124.3 |
| 16.00 | 164.4 | 150.2 | 134.6 |
| 17.00 | 170.3 | 154.7 | 131.8 |
| 18.00 | 173.1 | 155.4 | 140.2 |
| 19.00 | 169.3 | 154.6 | 137.7 |

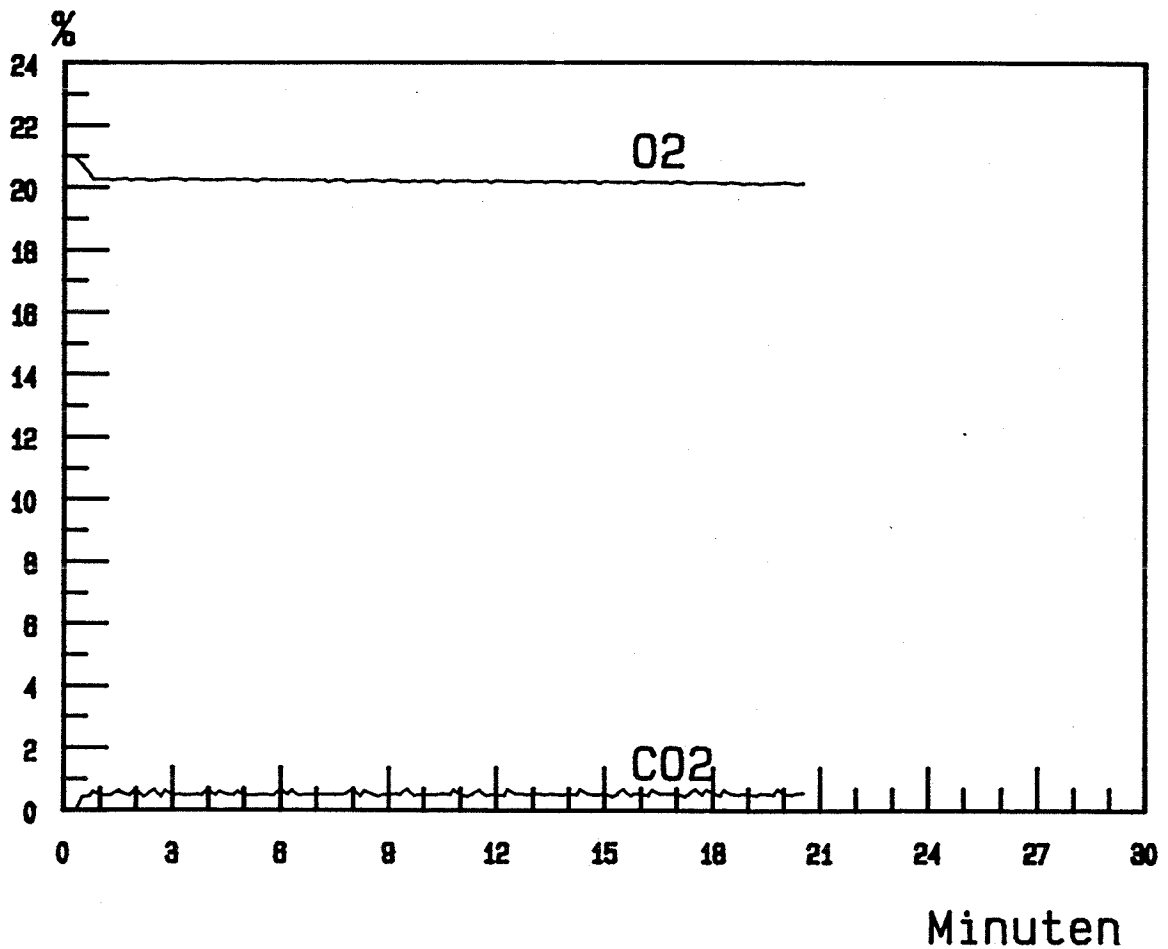
Temperaturen der Meßstellen 28 bis 30 bei Versuch 40.2



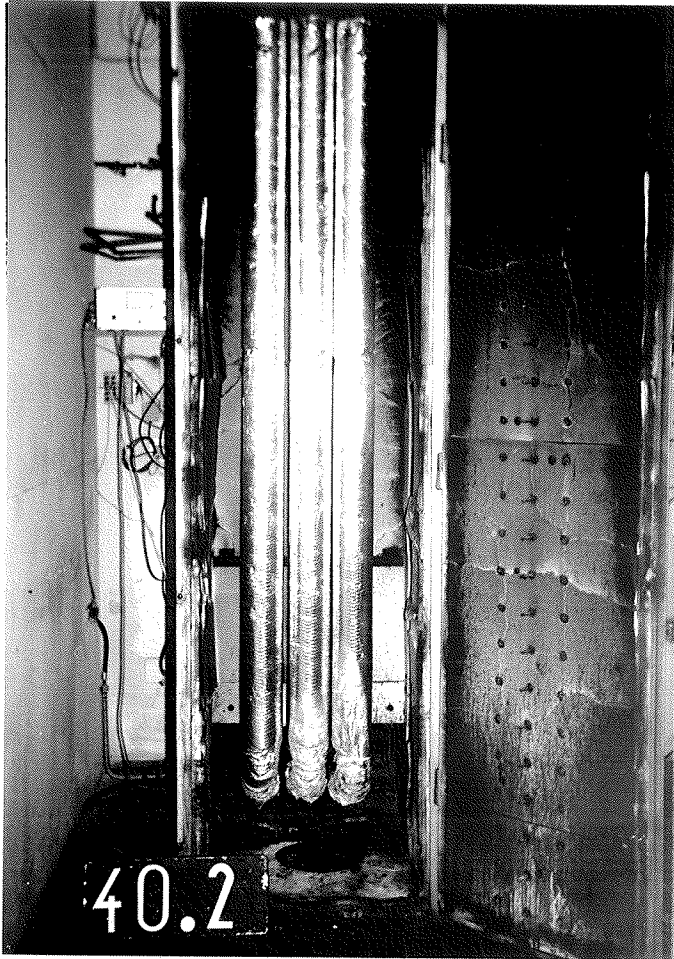
Temperatur und Flammenhoehe bei Versuch 40.2



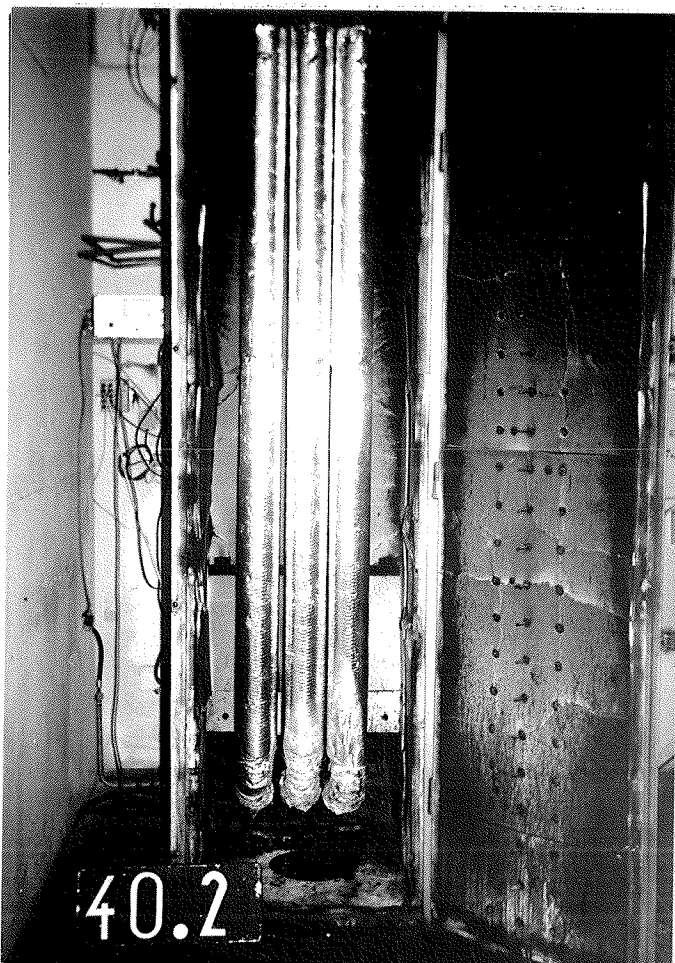
Druckverlauf im Brandraum bei Versuch 40.2



CO2. CO. O2 - Gehalt bei Versuch 40.2



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 40.3

Materialbeschreibung

Material Nr. 7.2 : ISOVER MIFA Alukaschiert

Abmessungen

Innendurchmesser/Außendurchmesser: 61 mm/102 mm
Wanddicke : 21 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 40.3 am 17.10..1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung der Holzkrippe (2 kg) durch zwei mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 5' 00" | Im Bereich des Knies über der Holzkrippe sind keine Materialveränderungen zu sehen. |
| 7' 15" | Flammenhöhe nimmt zu, keine Veränderungen am Material. |
| 10' 00" | Kleine Veränderungen an der Alukaschierung im Bereich des Knies. |
| 11' 00" | Flammenhöhe geht zurück. |
| 12' 00" | Holzstapel ausgebrannt. |
| 20' 00" | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge :

Probe 1: 2250 mm
Probe 2: 2250 mm **Mittelwert = 2250 mm**
Probe 3: 2250 mm

Im Bereich des Knies ist die Alukaschierung des Probenmaterials leicht angeschmolzen. Direkt über der Zündkrippe ist die Alukaschierung leicht verbrannt.

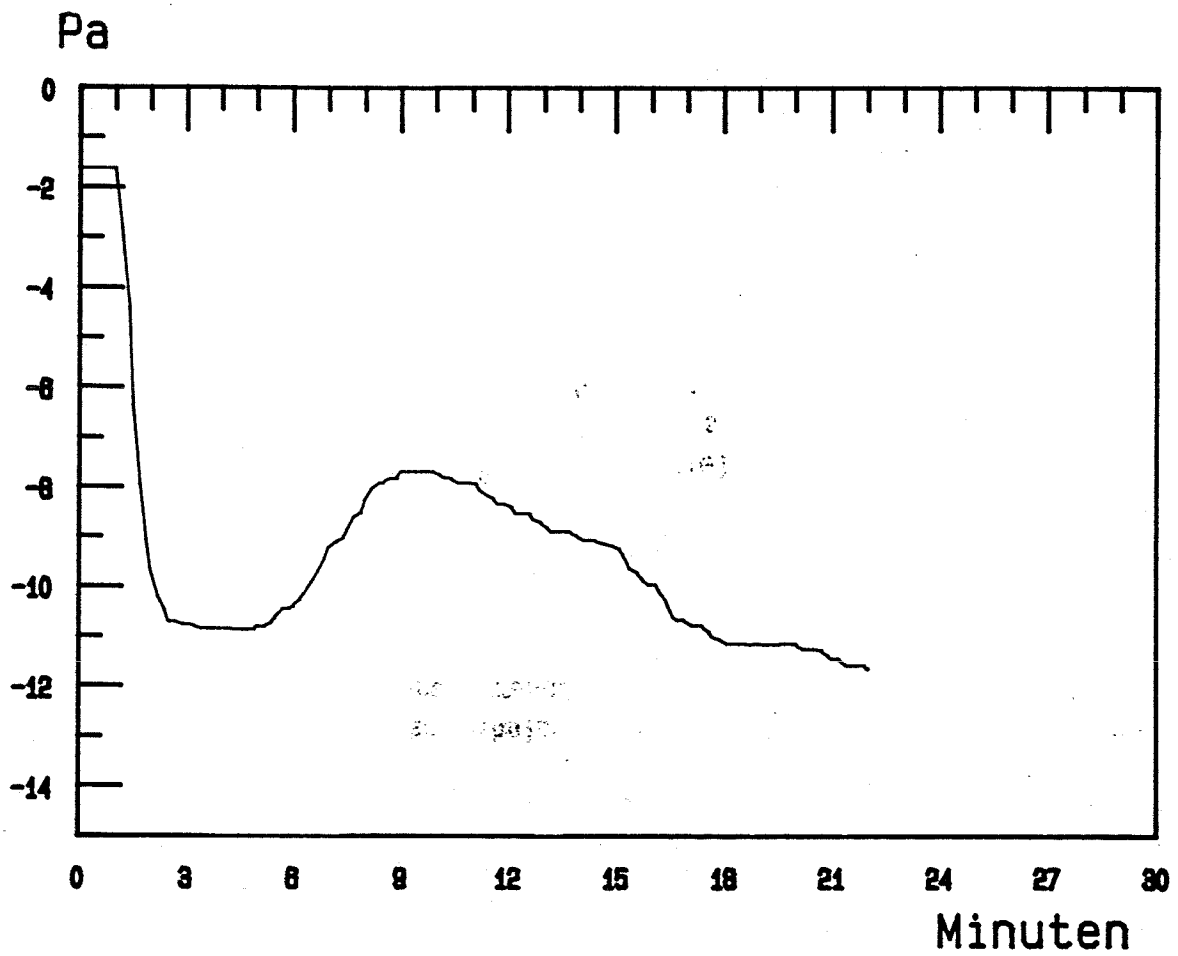
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 12.7 | 22.5 | 20.8 | 21.8 | 18.9 | 20.3 | 20.6 | 20.9 | 21.1 | 21.2 | 21.3 | 21.4 | 21.5 | 21.6 |
| 1.88 | 12.7 | 32.4 | 24.3 | 32.4 | 28.5 | 29.9 | 40.6 | 48.3 | 60.8 | 56.1 | 45.5 | 43.4 | 37.0 | 40.0 |
| 2.88 | 12.7 | 53.3 | 38.1 | 59.7 | 47.3 | 48.6 | 74.5 | 98.7 | 111.0 | 100.8 | 85.2 | 79.6 | 70.4 | 70.3 |
| 3.88 | 12.8 | 70.6 | 46.6 | 77.0 | 63.4 | 66.7 | 98.5 | 126.7 | 151.4 | 130.9 | 111.9 | 108.1 | 96.1 | 94.1 |
| 4.88 | 12.8 | 92.8 | 58.9 | 94.0 | 65.2 | 79.7 | 106.8 | 131.5 | 164.3 | 166.7 | 144.9 | 134.5 | 121.3 | 118.6 |
| 5.88 | 12.8 | 142.7 | 83.3 | 136.5 | 84.8 | 112.6 | 166.3 | 209.2 | 261.2 | 268.7 | 241.5 | 233.0 | 202.6 | 193.9 |
| 6.88 | 12.8 | 181.4 | 116.5 | 179.3 | 119.1 | 147.0 | 217.2 | 292.6 | 396.1 | 384.4 | 327.9 | 303.5 | 264.7 | 242.5 |
| 7.88 | 12.9 | 209.4 | 164.0 | 197.8 | 144.6 | 179.0 | 241.8 | 303.5 | 357.7 | 383.2 | 360.5 | 338.6 | 307.8 | 295.7 |
| 8.88 | 12.9 | 218.5 | 165.6 | 194.9 | 175.3 | 215.0 | 286.4 | 328.9 | 348.3 | 382.7 | 362.1 | 350.7 | 324.9 | 306.7 |
| 9.88 | 13.1 | 181.6 | 149.0 | 147.6 | 185.4 | 206.1 | 243.2 | 273.6 | 270.7 | 267.6 | 255.9 | 246.1 | 244.0 | 226.0 |
| 10.88 | 13.1 | 141.8 | 128.7 | 121.5 | 169.9 | 173.7 | 217.2 | 220.1 | 192.2 | 163.9 | 166.6 | 161.2 | 175.0 | 162.5 |
| 11.88 | 13.2 | 119.5 | 120.1 | 95.9 | 153.0 | 153.8 | 168.3 | 172.1 | 152.3 | 147.9 | 146.8 | 142.6 | 145.8 | 138.6 |
| 12.88 | 13.3 | 103.6 | 112.6 | 83.4 | 135.0 | 139.6 | 165.9 | 139.4 | 122.6 | 116.1 | 120.2 | 120.5 | 122.8 | 117.3 |
| 13.88 | 13.3 | 95.0 | 103.9 | 73.7 | 125.7 | 133.4 | 147.6 | 133.3 | 109.2 | 101.1 | 99.7 | 98.1 | 105.7 | 101.6 |
| 14.88 | 13.4 | 87.8 | 98.6 | 74.3 | 110.4 | 124.5 | 136.1 | 120.1 | 98.5 | 93.1 | 90.5 | 89.6 | 95.4 | 93.5 |
| 15.88 | 13.2 | 80.3 | 93.7 | 65.0 | 104.7 | 110.8 | 126.4 | 107.3 | 83.3 | 77.3 | 80.2 | 81.3 | 87.1 | 85.4 |
| 16.88 | 13.3 | 74.4 | 88.7 | 61.4 | 85.8 | 103.5 | 110.8 | 87.7 | 64.8 | 58.4 | 65.8 | 68.3 | 76.6 | 74.5 |
| 17.88 | 13.3 | 67.1 | 81.2 | 60.7 | 79.2 | 88.0 | 94.4 | 77.3 | 54.6 | 51.2 | 58.0 | 58.7 | 67.1 | 64.5 |
| 18.88 | 13.4 | 61.6 | 77.3 | 56.9 | 73.3 | 72.3 | 77.6 | 65.1 | 48.0 | 49.3 | 56.3 | 57.1 | 62.0 | 60.7 |
| 19.88 | 13.4 | 56.2 | 68.7 | 51.6 | 65.6 | 64.0 | 65.9 | 58.6 | 43.4 | 43.6 | 50.6 | 49.7 | 55.2 | 53.4 |
| 20.88 | 13.4 | 51.4 | 63.9 | 52.1 | 56.2 | 57.4 | 58.9 | 53.2 | 41.5 | 41.8 | 46.0 | 45.5 | 50.6 | 48.5 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 21.7 | 21.8 | 21.8 | 21.9 | 21.9 | 22.0 | 22.2 | 22.3 | 22.5 | 22.5 | 22.8 | 22.9 | 22.9 |
| 1.88 | 44.3 | 47.0 | 44.8 | 42.9 | 37.3 | 42.8 | 37.7 | 41.5 | 41.6 | 38.7 | 41.4 | 40.5 | 37.0 |
| 2.88 | 77.3 | 81.7 | 79.5 | 75.1 | 64.2 | 73.8 | 64.8 | 71.8 | 71.5 | 66.1 | 71.2 | 69.9 | 62.3 |
| 3.88 | 103.1 | 105.5 | 101.0 | 95.8 | 84.0 | 93.9 | 84.1 | 91.8 | 91.6 | 86.1 | 90.2 | 88.2 | 79.3 |
| 4.88 | 128.3 | 131.8 | 126.0 | 119.2 | 105.1 | 118.6 | 108.2 | 119.8 | 118.2 | 110.2 | 115.0 | 112.4 | 101.6 |
| 5.88 | 210.7 | 215.9 | 204.8 | 195.0 | 171.2 | 196.0 | 174.5 | 187.5 | 189.8 | 174.6 | 187.2 | 180.9 | 162.3 |
| 6.88 | 256.7 | 253.3 | 243.7 | 230.0 | 208.2 | 225.0 | 207.6 | 221.5 | 216.1 | 205.2 | 210.8 | 209.6 | 190.0 |
| 7.88 | 302.9 | 305.8 | 300.3 | 288.5 | 259.8 | 281.6 | 260.0 | 272.8 | 269.8 | 252.3 | 260.8 | 255.6 | 233.9 |
| 8.88 | 313.7 | 311.6 | 305.9 | 293.8 | 271.1 | 286.9 | 270.9 | 280.0 | 277.6 | 264.0 | 270.8 | 264.9 | 242.4 |
| 9.88 | 219.2 | 213.7 | 211.8 | 206.6 | 206.3 | 201.6 | 204.6 | 203.8 | 204.2 | 203.2 | 201.2 | 199.2 | 190.7 |
| 10.88 | 146.1 | 137.9 | 139.7 | 136.0 | 146.8 | 133.8 | 145.0 | 139.1 | 140.2 | 144.8 | 138.6 | 138.7 | 139.9 |
| 11.88 | 128.2 | 121.2 | 120.5 | 119.1 | 123.4 | 117.7 | 121.7 | 116.4 | 116.8 | 118.8 | 114.3 | 114.2 | 115.1 |
| 12.88 | 109.5 | 107.8 | 106.1 | 103.9 | 105.5 | 99.7 | 103.4 | 100.9 | 100.2 | 102.4 | 99.2 | 99.2 | 100.2 |
| 13.88 | 96.1 | 93.7 | 94.0 | 91.6 | 93.8 | 88.9 | 90.6 | 88.7 | 88.0 | 90.4 | 87.3 | 87.5 | 88.7 |
| 14.88 | 89.6 | 88.0 | 86.6 | 83.7 | 84.9 | 81.6 | 84.1 | 81.6 | 81.4 | 83.3 | 82.2 | 82.7 | 83.3 |
| 15.88 | 83.4 | 80.8 | 80.5 | 78.6 | 78.9 | 76.6 | 77.3 | 75.6 | 74.7 | 75.9 | 73.9 | 73.8 | 74.3 |
| 16.88 | 69.9 | 68.4 | 69.1 | 67.6 | 69.1 | 66.0 | 68.5 | 65.9 | 65.2 | 66.9 | 64.5 | 64.9 | 66.2 |
| 17.88 | 59.2 | 56.8 | 58.4 | 58.0 | 60.7 | 56.4 | 60.2 | 57.6 | 57.7 | 59.8 | 57.8 | 58.3 | 60.1 |
| 18.88 | 57.5 | 56.2 | 55.9 | 55.5 | 56.8 | 53.9 | 55.7 | 53.4 | 53.1 | 54.8 | 53.0 | 53.3 | 54.9 |
| 19.88 | 49.7 | 48.0 | 48.9 | 48.7 | 50.9 | 47.8 | 50.5 | 47.8 | 47.7 | 49.5 | 47.5 | 48.0 | 49.6 |
| 20.88 | 45.0 | 43.0 | 43.9 | 44.3 | 46.8 | 43.9 | 46.3 | 43.9 | 44.3 | 46.2 | 44.5 | 45.0 | 46.7 |

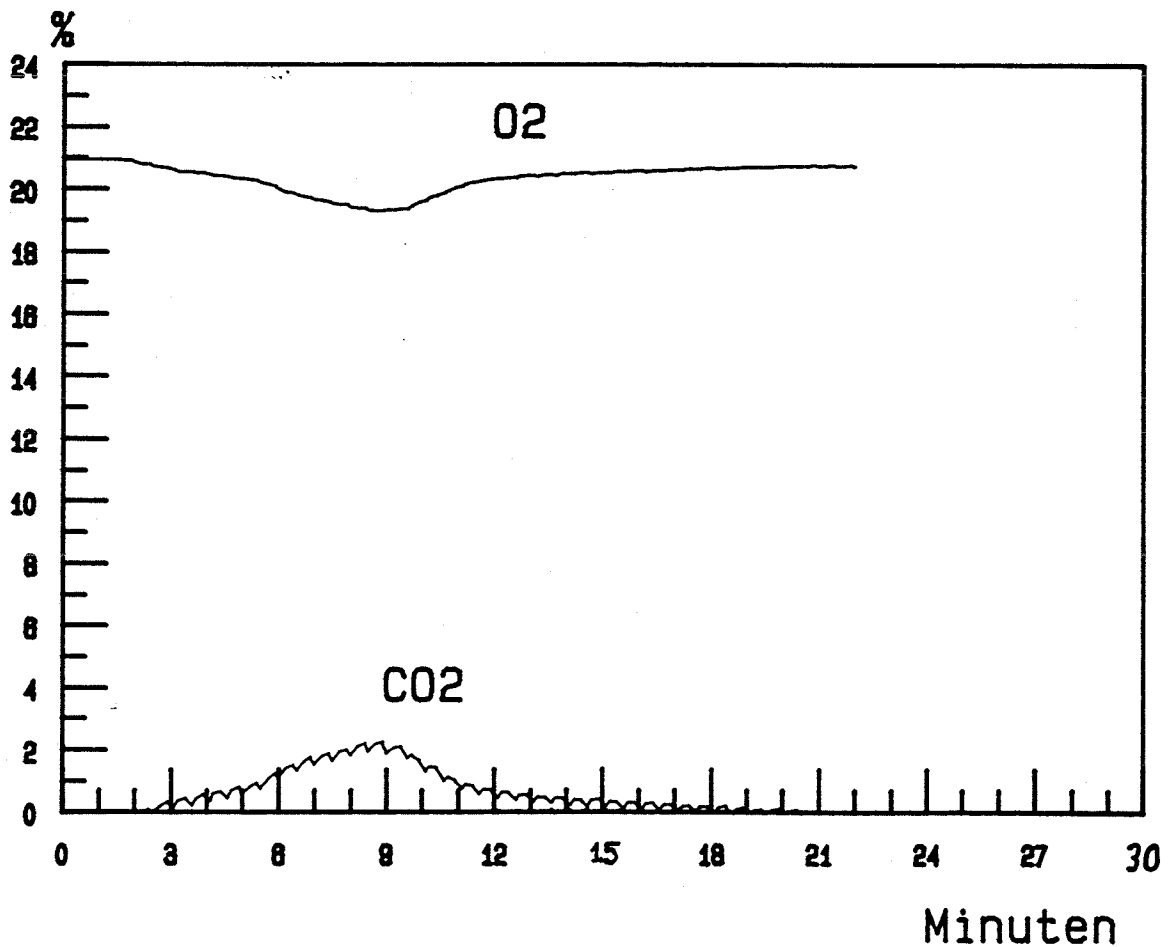
Temperaturen der Meßstellen 1 bis 27 bei Versuch 40.3

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 23.0 | 22.8 | 22.8 |
| 1.00 | 38.3 | 36.9 | 32.6 |
| 2.00 | 64.6 | 59.6 | 57.1 |
| 3.00 | 82.3 | 77.2 | 74.2 |
| 4.00 | 105.5 | 101.8 | 95.0 |
| 5.00 | 167.7 | 159.0 | 141.2 |
| 6.00 | 197.9 | 191.8 | 177.6 |
| 7.00 | 239.9 | 225.3 | 215.0 |
| 8.00 | 248.3 | 242.3 | 214.3 |
| 9.00 | 192.6 | 189.3 | 169.7 |
| 10.00 | 138.8 | 139.8 | 130.7 |
| 11.00 | 113.6 | 116.3 | 107.0 |
| 12.00 | 99.2 | 104.0 | 97.0 |
| 13.00 | 88.4 | 92.2 | 87.0 |
| 14.00 | 82.9 | 85.5 | 81.1 |
| 15.00 | 73.5 | 76.5 | 72.1 |
| 16.00 | 65.9 | 69.7 | 66.3 |
| 17.00 | 59.8 | 62.3 | 61.0 |
| 18.00 | 54.3 | 56.9 | 56.4 |
| 19.00 | 49.0 | 51.2 | 51.9 |
| 20.00 | 45.9 | 47.9 | 50.1 |

Temperaturen der Meßstellen 28 bis 30 bei Versuch 40.3

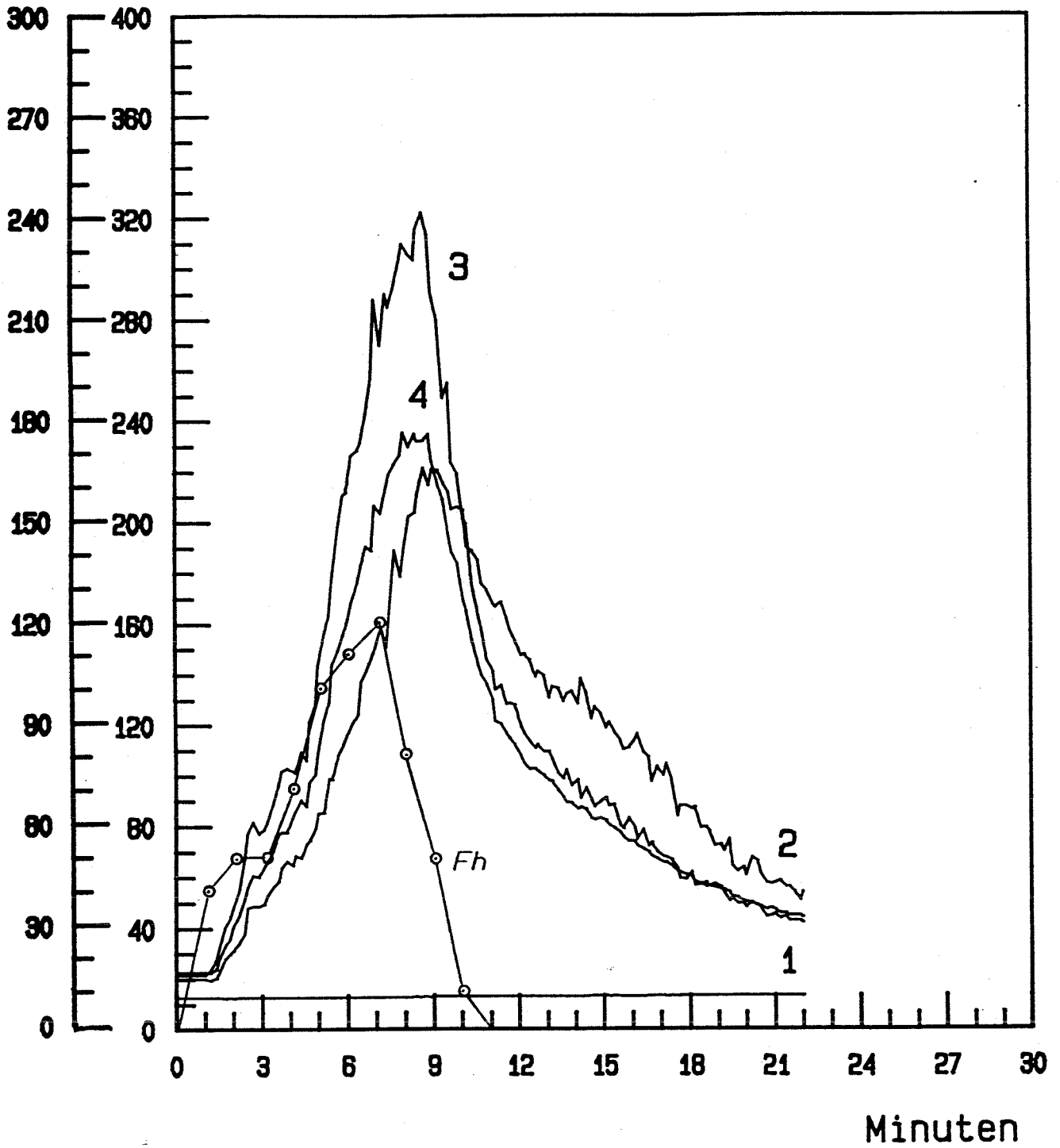


Druckverlauf im Brandraum bei Versuch 40.3

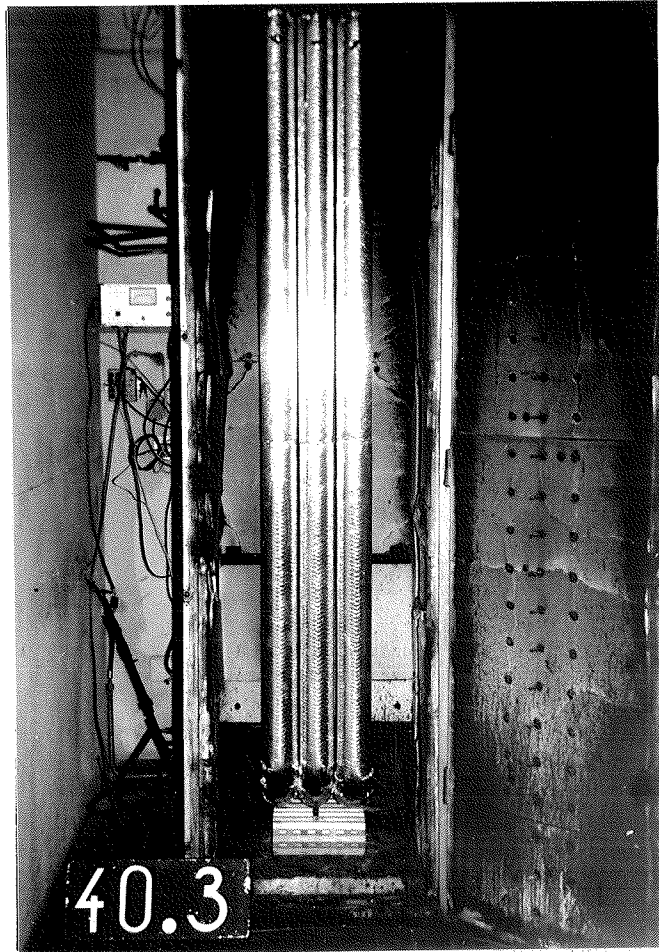


CO2, CO, O2 - Gehalt bei Versuch 40.3

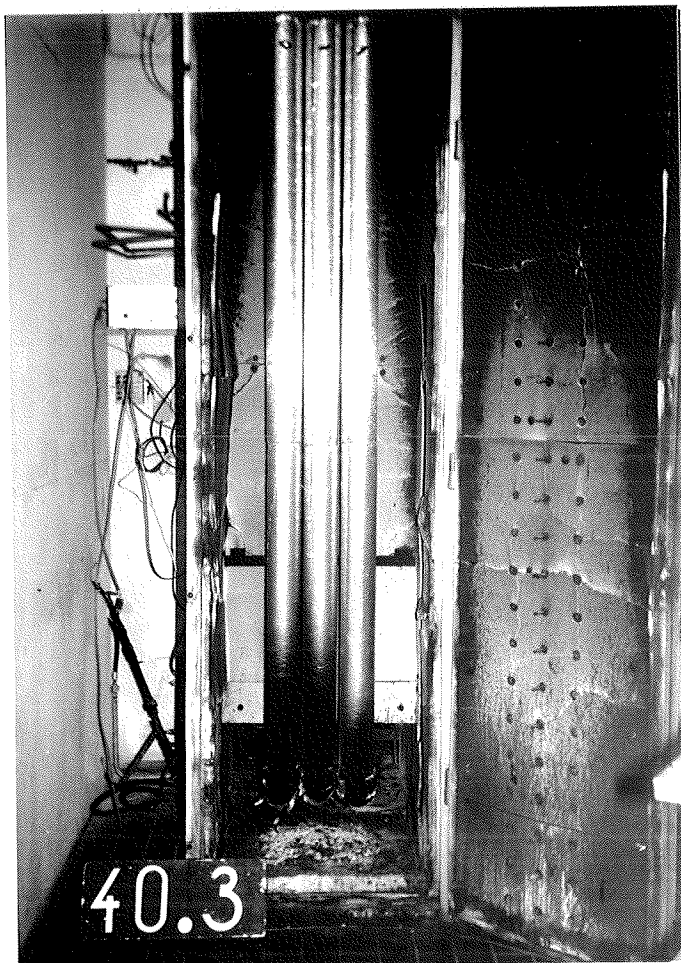
Fh (cm) C



Temperatur und Flammenhoehe bei Versuch 40.3



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 40.4

Materialbeschreibung

Material Nr. 7.2 : ISOVER MIFA Alukaschiert

Abmessungen

Innendurchmesser/Außendurchmesser: 61 mm/102 mm

Wanddicke : 21 mm

Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 40.4 am 18.10.1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung des Gasbrenners. |
| 4' 00" | Keine sichtbare Veränderung des Materials. |
| 10' 00" | Im Bereich des Knies verformt sich das Material leicht. |
| 15' 00" | Die Alukaschierung am vertikalen Schenkel des Materials ist leicht angeschmolzen. |
| 20' 00" | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge :

Probe 1: 2050 mm

Probe 2: 1950 mm

Mittelwert = 2050 mm

Probe 3: 2150 mm

Das Material im Bereich des Knies über dem Brenner ist teilweise zerstört.

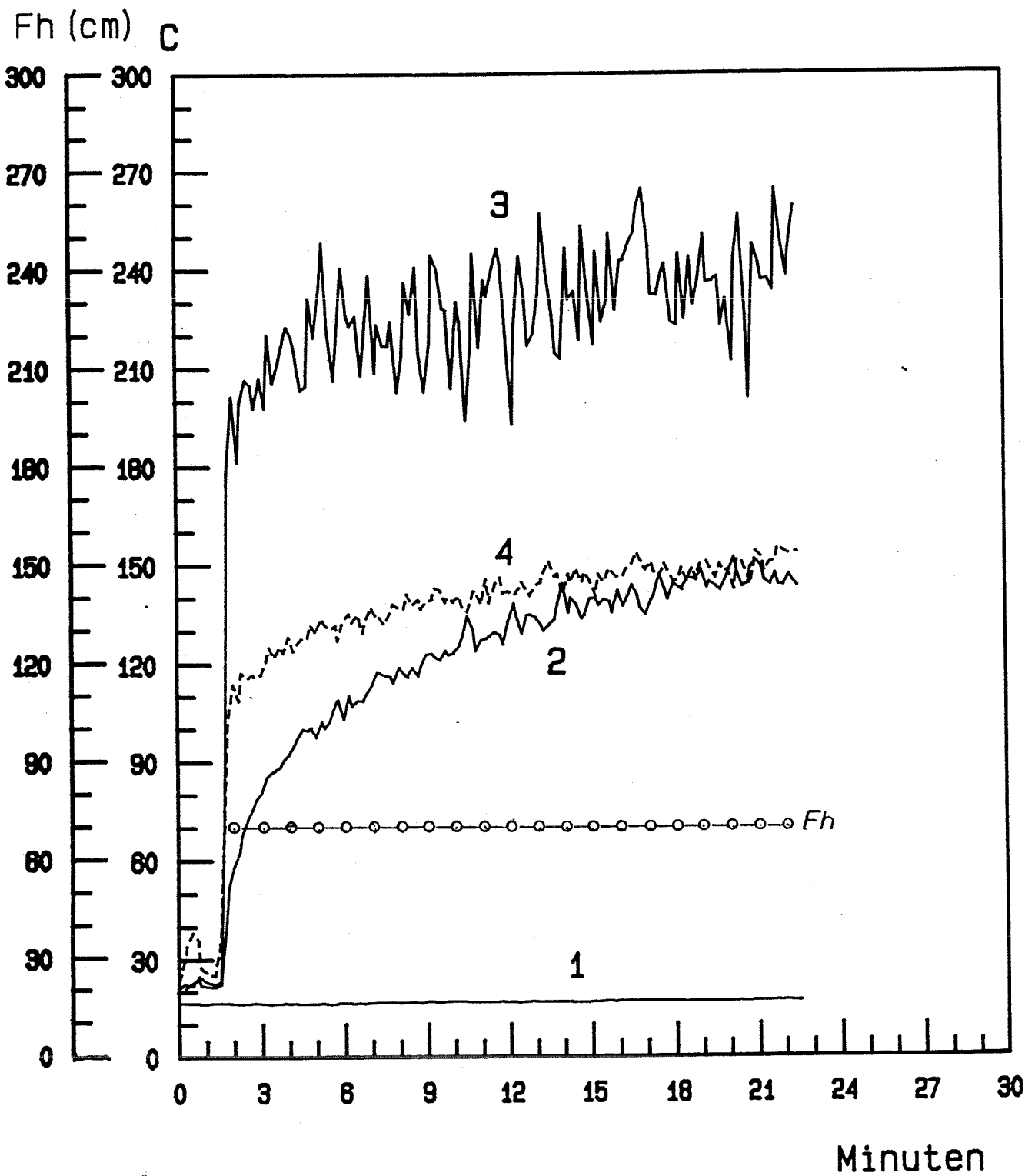
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 16.2 | 22.5 | 20.1 | 22.3 | 18.8 | 19.2 | 20.1 | 19.9 | 20.3 | 20.9 | 20.6 | 20.4 | 20.2 | 20.1 |
| 1.00 | 16.2 | 28.1 | 46.2 | 27.9 | 21.1 | 21.4 | 22.3 | 21.9 | 22.0 | 22.3 | 22.1 | 22.3 | 22.2 | 22.2 |
| 2.00 | 16.1 | 82.1 | 81.8 | 67.7 | 48.5 | 57.8 | 87.3 | 107.7 | 162.1 | 204.4 | 187.2 | 186.5 | 160.1 | 176.4 |
| 3.00 | 16.1 | 98.7 | 70.3 | 75.6 | 69.9 | 80.5 | 112.1 | 139.2 | 195.1 | 225.9 | 205.2 | 203.0 | 190.4 | 187.7 |
| 4.00 | 16.1 | 106.6 | 64.7 | 73.0 | 83.2 | 92.0 | 131.8 | 158.6 | 204.3 | 230.2 | 220.1 | 223.5 | 205.6 | 204.1 |
| 5.00 | 16.1 | 109.6 | 82.7 | 83.4 | 92.2 | 97.3 | 127.9 | 156.7 | 165.7 | 206.4 | 205.2 | 215.2 | 208.1 | 207.9 |
| 6.00 | 16.3 | 114.8 | 79.5 | 84.8 | 98.6 | 102.8 | 140.9 | 178.4 | 229.1 | 244.2 | 224.0 | 232.3 | 225.7 | 226.2 |
| 7.00 | 16.3 | 117.7 | 89.6 | 81.3 | 109.1 | 112.9 | 146.9 | 167.3 | 177.1 | 196.5 | 204.8 | 224.4 | 220.9 | 229.3 |
| 8.00 | 16.4 | 117.3 | 89.5 | 92.2 | 119.2 | 118.7 | 145.7 | 161.9 | 196.7 | 229.8 | 213.1 | 210.1 | 205.3 | 201.8 |
| 9.00 | 16.7 | 119.6 | 87.4 | 91.7 | 119.8 | 122.7 | 146.1 | 164.3 | 167.3 | 184.5 | 193.9 | 209.3 | 209.1 | 201.9 |
| 10.00 | 16.7 | 122.0 | 120.5 | 107.2 | 124.0 | 122.8 | 150.4 | 165.7 | 152.0 | 165.9 | 173.5 | 191.4 | 204.4 | 203.1 |
| 11.00 | 16.5 | 121.2 | 113.5 | 91.1 | 120.8 | 126.8 | 161.3 | 180.3 | 201.5 | 221.6 | 217.0 | 222.0 | 219.9 | 214.3 |
| 12.00 | 16.5 | 123.6 | 99.9 | 91.7 | 127.6 | 132.3 | 164.6 | 190.7 | 191.7 | 207.3 | 215.1 | 221.2 | 219.5 | 219.9 |
| 13.00 | 16.6 | 125.7 | 120.5 | 108.2 | 130.8 | 133.7 | 165.7 | 185.5 | 174.6 | 197.6 | 206.3 | 221.2 | 212.2 | 216.1 |
| 14.00 | 16.6 | 126.2 | 132.4 | 105.9 | 141.7 | 143.9 | 169.8 | 186.5 | 171.1 | 174.3 | 182.0 | 192.5 | 206.3 | 208.2 |
| 15.00 | 16.4 | 129.4 | 106.9 | 90.5 | 132.8 | 139.4 | 172.0 | 196.2 | 196.3 | 216.4 | 213.8 | 225.1 | 225.0 | 222.3 |
| 16.00 | 16.7 | 130.2 | 104.9 | 95.6 | 135.3 | 141.9 | 176.6 | 195.0 | 197.1 | 219.7 | 227.7 | 231.5 | 226.7 | 228.7 |
| 17.00 | 16.8 | 130.5 | 104.0 | 88.6 | 126.2 | 134.4 | 180.0 | 223.2 | 248.3 | 262.3 | 259.2 | 267.2 | 255.3 | 258.5 |
| 18.00 | 16.7 | 131.9 | 111.2 | 100.3 | 139.9 | 143.9 | 178.1 | 207.3 | 212.7 | 224.3 | 224.2 | 228.1 | 232.6 | 228.1 |
| 19.00 | 16.6 | 130.7 | 124.1 | 104.2 | 141.7 | 148.2 | 181.4 | 207.9 | 192.1 | 206.2 | 208.7 | 215.7 | 221.2 | 226.0 |
| 20.00 | 16.6 | 131.1 | 120.5 | 103.2 | 139.3 | 147.2 | 181.7 | 212.6 | 223.0 | 223.9 | 225.6 | 228.9 | 231.0 | 228.6 |
| 21.00 | 16.8 | 135.3 | 116.5 | 117.0 | 145.1 | 150.9 | 178.3 | 201.0 | 206.0 | 223.9 | 235.5 | 256.1 | 236.3 | 237.5 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 20.8 | 21.7 | 21.8 | 21.8 | 21.2 | 22.5 | 21.6 | 22.4 | 22.4 | 21.9 | 22.6 | 22.7 | 22.5 |
| 1.00 | 22.8 | 23.5 | 23.4 | 23.4 | 23.4 | 23.5 | 23.7 | 24.5 | 24.4 | 24.7 | 24.5 | 24.8 | 25.0 |
| 2.00 | 201.2 | 212.7 | 198.0 | 183.9 | 147.6 | 173.8 | 140.2 | 159.0 | 155.5 | 137.4 | 148.8 | 142.5 | 122.5 |
| 3.00 | 206.8 | 207.8 | 193.7 | 179.2 | 159.1 | 168.8 | 148.9 | 156.2 | 148.6 | 136.4 | 137.1 | 131.8 | 119.7 |
| 4.00 | 222.7 | 225.8 | 215.3 | 198.5 | 179.5 | 191.6 | 172.5 | 176.3 | 172.4 | 158.7 | 159.9 | 154.8 | 139.4 |
| 5.00 | 219.3 | 218.3 | 207.3 | 196.3 | 178.4 | 177.9 | 164.7 | 164.8 | 160.5 | 155.0 | 154.5 | 150.8 | 140.2 |
| 6.00 | 240.4 | 238.8 | 226.6 | 210.4 | 190.3 | 193.3 | 176.9 | 177.7 | 172.5 | 163.4 | 162.6 | 155.2 | 144.1 |
| 7.00 | 238.1 | 232.7 | 226.7 | 212.9 | 193.3 | 197.3 | 179.7 | 182.2 | 177.1 | 167.9 | 167.1 | 161.1 | 149.7 |
| 8.00 | 202.6 | 203.7 | 197.0 | 187.5 | 178.3 | 179.4 | 171.1 | 171.2 | 169.7 | 162.5 | 163.2 | 158.7 | 148.6 |
| 9.00 | 202.6 | 203.3 | 199.8 | 192.1 | 179.2 | 181.6 | 173.6 | 175.0 | 172.2 | 164.6 | 164.8 | 159.8 | 149.5 |
| 10.00 | 203.8 | 201.1 | 196.2 | 191.0 | 181.6 | 178.7 | 172.0 | 171.2 | 169.0 | 161.0 | 160.0 | 156.9 | 146.7 |
| 11.00 | 216.0 | 208.9 | 199.8 | 188.2 | 179.6 | 174.0 | 169.8 | 168.1 | 163.3 | 159.5 | 155.7 | 153.2 | 145.8 |
| 12.00 | 219.7 | 217.8 | 211.7 | 201.3 | 188.0 | 184.3 | 176.0 | 176.7 | 170.0 | 164.4 | 161.0 | 158.0 | 150.0 |
| 13.00 | 220.2 | 216.7 | 211.9 | 200.5 | 188.7 | 189.4 | 177.5 | 176.3 | 171.5 | 164.4 | 160.5 | 158.2 | 148.7 |
| 14.00 | 212.7 | 209.1 | 201.1 | 193.7 | 185.4 | 181.6 | 175.2 | 171.4 | 168.8 | 161.1 | 157.7 | 153.8 | 148.0 |
| 15.00 | 234.7 | 232.0 | 222.2 | 209.4 | 193.8 | 196.1 | 183.0 | 181.0 | 176.3 | 171.5 | 170.8 | 165.4 | 156.4 |
| 16.00 | 227.4 | 226.5 | 216.0 | 205.5 | 194.5 | 191.0 | 182.8 | 183.9 | 177.8 | 171.2 | 169.1 | 165.4 | 155.4 |
| 17.00 | 264.4 | 262.2 | 247.1 | 229.7 | 209.8 | 212.9 | 196.4 | 198.5 | 191.3 | 179.9 | 178.6 | 171.3 | 158.3 |
| 18.00 | 223.6 | 218.0 | 210.4 | 201.0 | 191.4 | 185.7 | 178.4 | 179.0 | 172.4 | 167.0 | 162.8 | 159.0 | 152.0 |
| 19.00 | 236.1 | 239.6 | 228.3 | 219.1 | 201.7 | 203.7 | 191.2 | 188.9 | 184.2 | 175.5 | 174.2 | 169.8 | 160.4 |
| 20.00 | 230.9 | 235.0 | 225.7 | 215.7 | 201.8 | 200.9 | 187.5 | 186.8 | 181.3 | 175.0 | 172.7 | 168.7 | 159.7 |
| 21.00 | 247.3 | 235.1 | 222.7 | 211.4 | 196.7 | 200.7 | 188.0 | 187.7 | 186.7 | 178.2 | 180.1 | 177.4 | 166.5 |

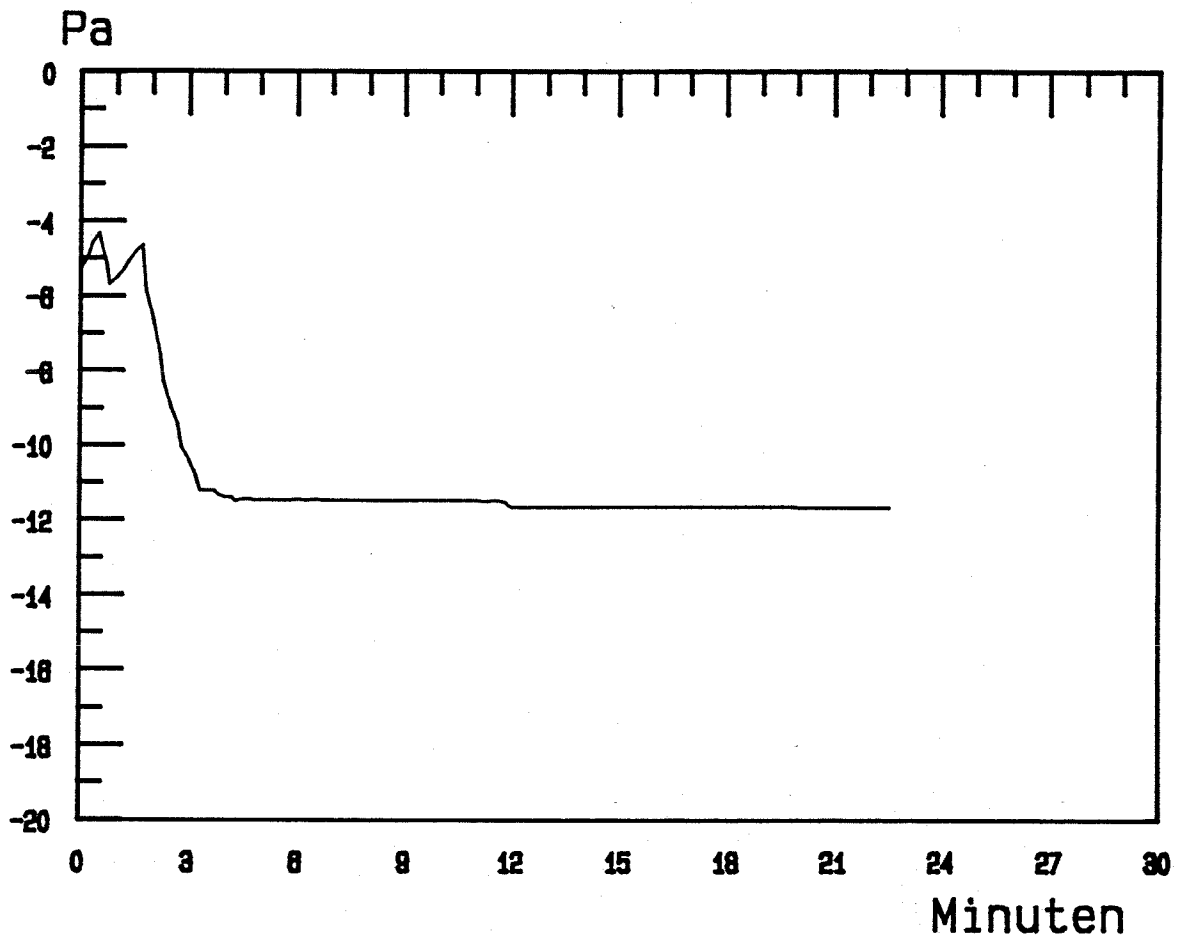
Temperaturen der Meßstellen 1 bis 27 bei Versuch 40.4

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 22.6 | 23.2 | 22.9 |
| 1.00 | 25.0 | 25.6 | 26.1 |
| 2.00 | 127.6 | 113.0 | 100.6 |
| 3.00 | 124.2 | 118.8 | 107.0 |
| 4.00 | 141.6 | 130.1 | 113.1 |
| 5.00 | 141.1 | 129.6 | 116.2 |
| 6.00 | 144.2 | 132.3 | 123.6 |
| 7.00 | 150.3 | 138.3 | 123.2 |
| 8.00 | 149.1 | 140.0 | 121.2 |
| 9.00 | 150.4 | 141.4 | 123.9 |
| 10.00 | 147.7 | 141.2 | 126.8 |
| 11.00 | 145.8 | 140.1 | 127.5 |
| 12.00 | 150.3 | 143.6 | 131.5 |
| 13.00 | 149.8 | 145.4 | 135.5 |
| 14.00 | 148.6 | 143.4 | 130.2 |
| 15.00 | 156.8 | 147.4 | 130.9 |
| 16.00 | 155.6 | 148.0 | 133.3 |
| 17.00 | 159.0 | 149.2 | 136.7 |
| 18.00 | 153.1 | 145.3 | 135.7 |
| 19.00 | 160.2 | 151.2 | 139.3 |
| 20.00 | 158.5 | 149.5 | 136.0 |
| 21.00 | 165.0 | 155.4 | 140.9 |

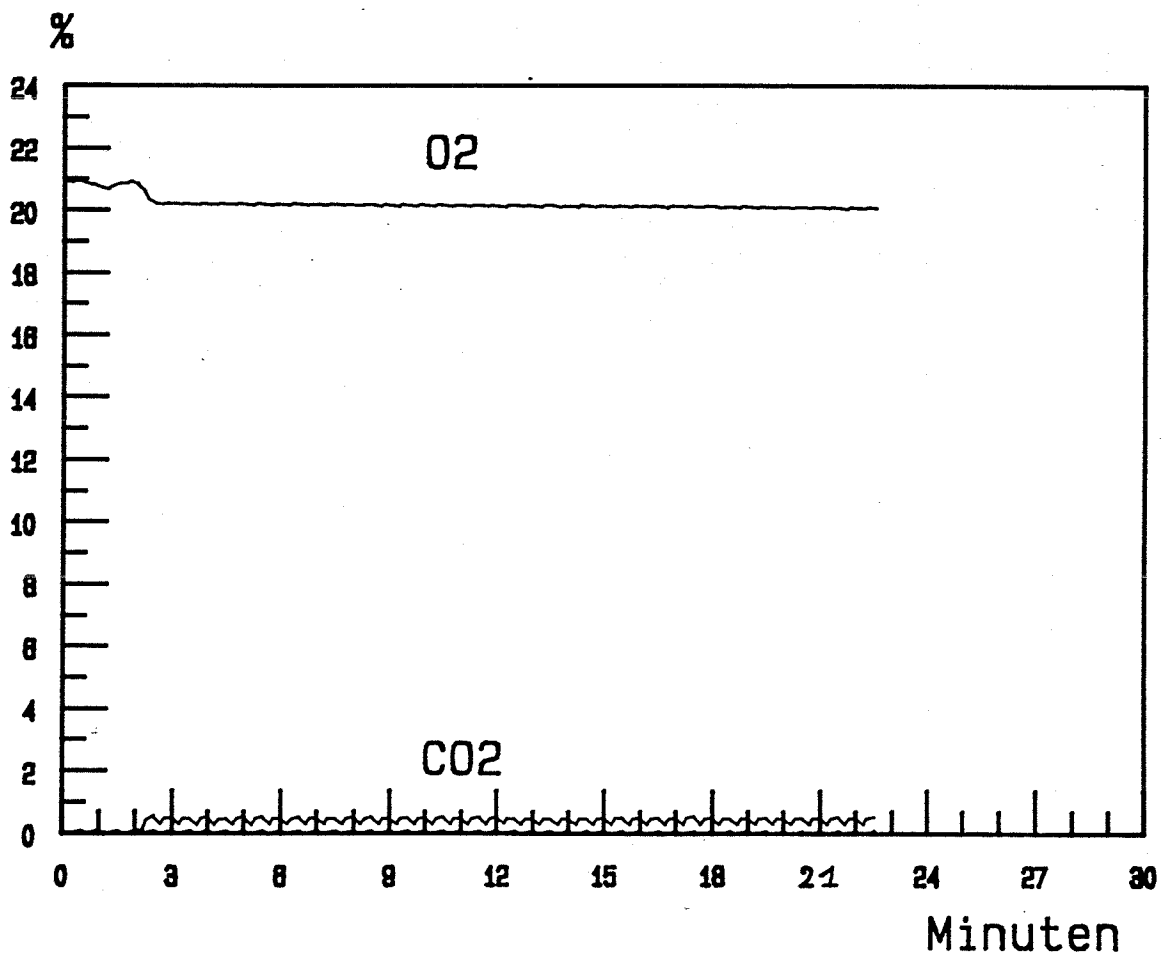
Temperaturen der Meßstellen 28 bis 30 bei Versuch 40.4



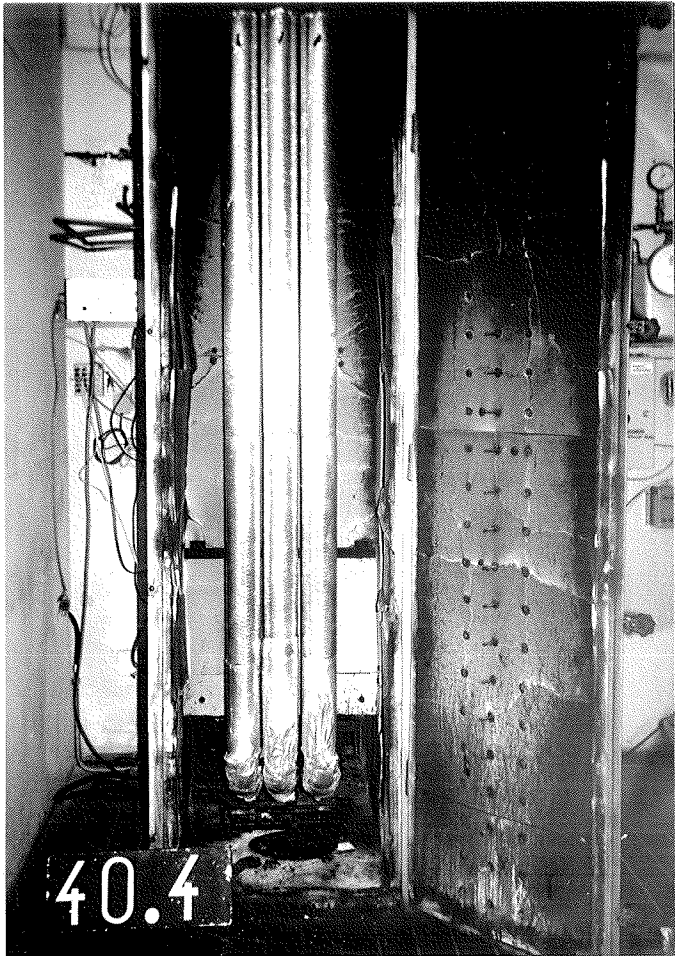
Temperatur und Flammenhoehe bei Versuch 40.4



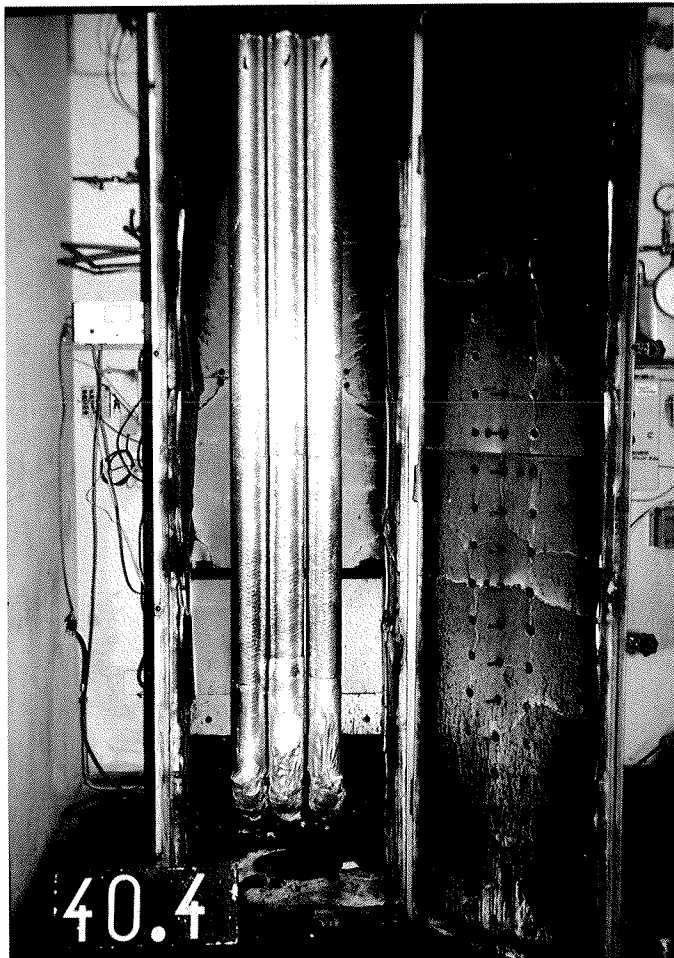
Druckverlauf im Brandraum bei Versuch 40.4



CO2, CO, O2 - Gehalt bei Versuch 40.4



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 41.1

Materialbeschreibung

Material Nr. 8.1 : ISOVER MIFA mit PVC-Folienkaschierung

Abmessungen

Innendurchmesser/Außendurchmesser: 61 mm/124 mm

Wanddicke : 31,5 mm

Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 41.1 am 10.11.1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung der Holzkrippe (2 kg) durch zwei mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 1' 00" | Das Material im Bereich des Knies über der Zündlast verformt sich. |
| 2' 30" | In diesem Bereich kräuselt sich das Material. |
| 5' 30" | Flammenhöhe nimmt zu, die Folienkaschierung wellt sich zusammen. |
| 9' 00" | Flammenhöhe nimmt ab. |
| 10' 00" | Holzstapel ausgebrannt. |
| 12' 00" | Keine weiteren Veränderungen am Material. |
| 20' 00" | Versuchsende. |

Beobachtungen nach dem Versuch

mittlere Restlänge : 0 mm

Die Folienkaschierung ist bis zur Aufhängung teilweise verbrannt bzw. karbonisiert. An dem darunter liegenden Dämmstoff aus Mineralfaser ist bis auf eine weiße Einfärbung des Materials keine Veränderung festzustellen.

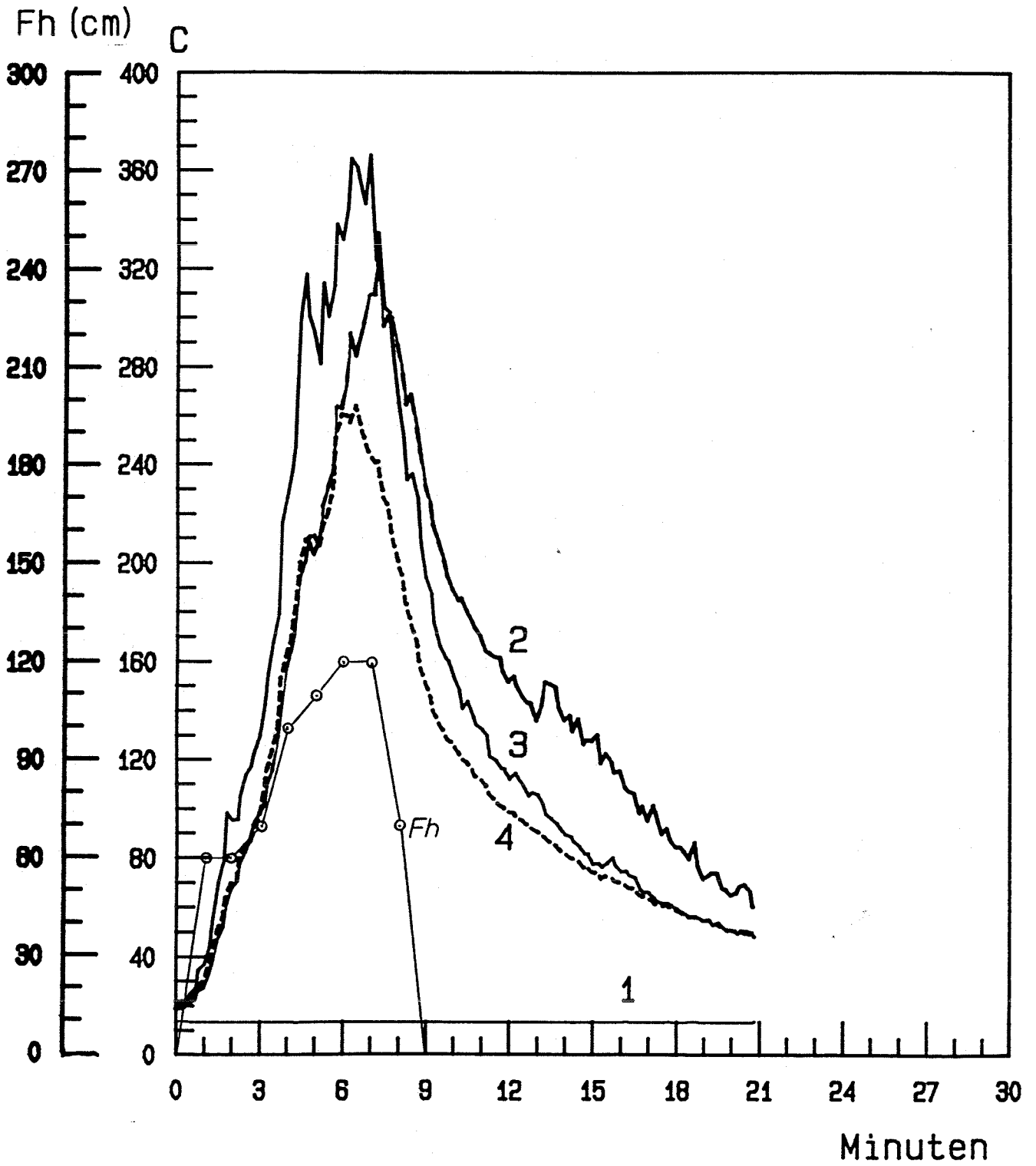
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 13.7 | 21.6 | 20.6 | 21.2 | 18.2 | 18.7 | 19.5 | 20.3 | 20.5 | 20.7 | 20.9 | 21.0 | 21.2 | 21.2 |
| 1.00 | 13.4 | 28.5 | 29.7 | 29.1 | 25.5 | 27.3 | 30.8 | 32.0 | 41.7 | 42.3 | 35.8 | 34.5 | 31.1 | 32.2 |
| 2.00 | 13.3 | 59.0 | 48.0 | 53.8 | 61.4 | 67.5 | 90.3 | 105.9 | 157.5 | 151.4 | 122.1 | 103.6 | 88.2 | 82.5 |
| 3.00 | 13.4 | 84.8 | 82.0 | 80.5 | 78.7 | 98.0 | 119.3 | 123.8 | 165.1 | 161.3 | 141.7 | 137.5 | 121.3 | 115.2 |
| 4.00 | 13.3 | 136.9 | 113.8 | 125.3 | 103.5 | 156.6 | 200.0 | 230.5 | 297.9 | 313.9 | 266.3 | 248.1 | 216.5 | 202.9 |
| 5.00 | 13.4 | 194.8 | 162.5 | 151.1 | 156.8 | 203.5 | 255.3 | 276.2 | 283.7 | 313.7 | 315.5 | 313.0 | 302.8 | 283.6 |
| 6.00 | 13.4 | 254.6 | 415.3 | 286.4 | 189.9 | 263.0 | 330.0 | 372.9 | 406.8 | 430.1 | 404.6 | 379.9 | 350.9 | 332.0 |
| 7.00 | 13.4 | 239.9 | 287.3 | 209.5 | 238.3 | 309.5 | 381.2 | 419.9 | 452.5 | 468.5 | 454.5 | 423.4 | 394.4 | 368.9 |
| 8.00 | 13.4 | 210.0 | 337.2 | 192.4 | 233.6 | 288.9 | 330.9 | 354.2 | 312.8 | 304.3 | 313.3 | 302.6 | 303.7 | 282.0 |
| 9.00 | 13.4 | 161.2 | 187.0 | 131.3 | 185.6 | 231.6 | 254.8 | 256.5 | 210.0 | 202.7 | 223.2 | 219.2 | 224.3 | 212.2 |
| 10.00 | 13.4 | 136.3 | 156.4 | 111.2 | 179.4 | 189.6 | 204.7 | 198.3 | 165.0 | 159.3 | 173.1 | 171.3 | 176.9 | 169.4 |
| 11.00 | 13.5 | 121.8 | 139.2 | 95.1 | 144.7 | 170.3 | 192.0 | 181.7 | 147.4 | 136.3 | 144.5 | 142.8 | 150.7 | 143.3 |
| 12.00 | 13.4 | 108.4 | 118.2 | 81.5 | 131.3 | 151.5 | 167.7 | 154.6 | 122.1 | 111.0 | 121.6 | 120.0 | 128.2 | 121.3 |
| 13.00 | 13.5 | 99.6 | 113.3 | 77.0 | 119.9 | 135.5 | 152.2 | 136.6 | 99.2 | 91.7 | 109.7 | 109.6 | 115.7 | 111.2 |
| 14.00 | 13.5 | 91.1 | 98.0 | 69.0 | 123.1 | 135.8 | 142.6 | 122.8 | 91.9 | 84.0 | 93.7 | 93.0 | 100.6 | 95.3 |
| 15.00 | 13.5 | 85.9 | 94.4 | 67.3 | 119.4 | 127.6 | 130.6 | 111.7 | 80.5 | 74.0 | 81.4 | 81.4 | 89.3 | 84.2 |
| 16.00 | 13.5 | 79.1 | 83.2 | 61.1 | 109.0 | 115.2 | 124.4 | 107.9 | 80.4 | 73.9 | 78.1 | 77.0 | 83.7 | 79.1 |
| 17.00 | 13.5 | 74.4 | 79.4 | 58.2 | 81.3 | 95.1 | 101.3 | 89.0 | 63.2 | 59.3 | 67.7 | 68.4 | 75.5 | 71.0 |
| 18.00 | 13.5 | 69.6 | 75.5 | 57.2 | 72.0 | 84.5 | 88.5 | 76.7 | 54.8 | 52.2 | 62.5 | 61.7 | 68.3 | 63.9 |
| 19.00 | 13.5 | 63.7 | 69.3 | 56.3 | 65.2 | 71.6 | 75.6 | 69.9 | 53.1 | 50.7 | 56.5 | 56.3 | 62.5 | 58.5 |
| 20.00 | 13.5 | 58.6 | 63.2 | 50.2 | 61.4 | 65.1 | 69.4 | 62.6 | 48.0 | 45.8 | 52.0 | 52.8 | 57.9 | 54.2 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 21.2 | 21.3 | 21.4 | 21.4 | 21.5 | 21.5 | 21.5 | 21.5 | 21.5 | 21.6 | 21.6 | 21.6 | 21.8 |
| 1.00 | 36.9 | 39.2 | 37.3 | 35.9 | 31.9 | 36.9 | 30.9 | 33.6 | 33.7 | 29.4 | 33.4 | 33.4 | 31.6 |
| 2.00 | 95.2 | 102.3 | 94.3 | 86.6 | 71.9 | 86.5 | 71.0 | 84.5 | 83.3 | 67.3 | 82.6 | 83.1 | 70.9 |
| 3.00 | 129.4 | 132.5 | 124.9 | 116.3 | 101.1 | 117.9 | 101.2 | 113.9 | 113.5 | 95.3 | 110.3 | 110.5 | 97.3 |
| 4.00 | 226.3 | 232.8 | 221.2 | 204.7 | 177.4 | 209.5 | 180.7 | 201.1 | 200.3 | 165.0 | 196.0 | 196.3 | 171.5 |
| 5.00 | 293.9 | 302.9 | 290.7 | 279.6 | 249.1 | 271.3 | 244.3 | 265.0 | 263.1 | 228.2 | 255.4 | 252.6 | 227.6 |
| 6.00 | 331.9 | 337.8 | 321.9 | 303.8 | 278.4 | 297.0 | 276.1 | 293.3 | 287.6 | 257.7 | 281.2 | 283.1 | 258.5 |
| 7.00 | 366.4 | 364.2 | 343.0 | 326.5 | 306.8 | 317.7 | 296.3 | 306.5 | 300.1 | 276.0 | 284.3 | 282.0 | 260.1 |
| 8.00 | 265.4 | 254.2 | 248.9 | 242.8 | 244.6 | 233.4 | 237.6 | 234.3 | 229.7 | 233.6 | 221.6 | 219.5 | 212.9 |
| 9.00 | 194.0 | 179.4 | 179.4 | 176.2 | 185.6 | 170.7 | 182.3 | 171.8 | 170.1 | 182.6 | 162.8 | 160.0 | 161.8 |
| 10.00 | 154.0 | 142.1 | 143.7 | 140.6 | 148.4 | 138.2 | 146.3 | 137.0 | 137.6 | 148.3 | 132.9 | 131.8 | 133.6 |
| 11.00 | 132.3 | 123.2 | 123.6 | 121.0 | 126.2 | 119.7 | 124.9 | 118.5 | 118.4 | 126.6 | 115.8 | 115.5 | 116.4 |
| 12.00 | 111.8 | 103.8 | 105.1 | 102.5 | 107.4 | 101.9 | 107.2 | 102.4 | 102.5 | 108.8 | 100.1 | 99.6 | 100.8 |
| 13.00 | 105.4 | 100.5 | 99.9 | 96.9 | 98.7 | 94.9 | 97.9 | 95.1 | 94.5 | 98.4 | 92.2 | 91.8 | 92.5 |
| 14.00 | 89.1 | 84.2 | 86.8 | 85.1 | 88.5 | 83.4 | 87.1 | 84.0 | 83.8 | 88.4 | 82.7 | 82.7 | 83.0 |
| 15.00 | 77.4 | 72.6 | 75.4 | 73.2 | 77.3 | 71.7 | 76.6 | 72.8 | 72.9 | 78.6 | 72.7 | 72.9 | 74.4 |
| 16.00 | 74.3 | 71.7 | 72.5 | 71.1 | 73.1 | 70.1 | 72.2 | 70.6 | 70.3 | 73.4 | 69.5 | 69.7 | 70.2 |
| 17.00 | 66.0 | 61.9 | 63.1 | 62.1 | 64.9 | 60.8 | 64.1 | 61.3 | 61.7 | 66.3 | 61.3 | 61.6 | 63.1 |
| 18.00 | 59.5 | 56.2 | 57.7 | 56.9 | 59.2 | 55.6 | 58.5 | 56.1 | 56.6 | 60.7 | 56.3 | 56.7 | 58.1 |
| 19.00 | 54.6 | 51.6 | 52.9 | 52.4 | 54.8 | 51.4 | 53.9 | 51.9 | 52.4 | 56.2 | 52.1 | 52.2 | 53.7 |
| 20.00 | 50.7 | 47.9 | 49.1 | 48.9 | 51.2 | 48.2 | 50.4 | 48.3 | 49.0 | 52.4 | 48.8 | 49.0 | 50.4 |

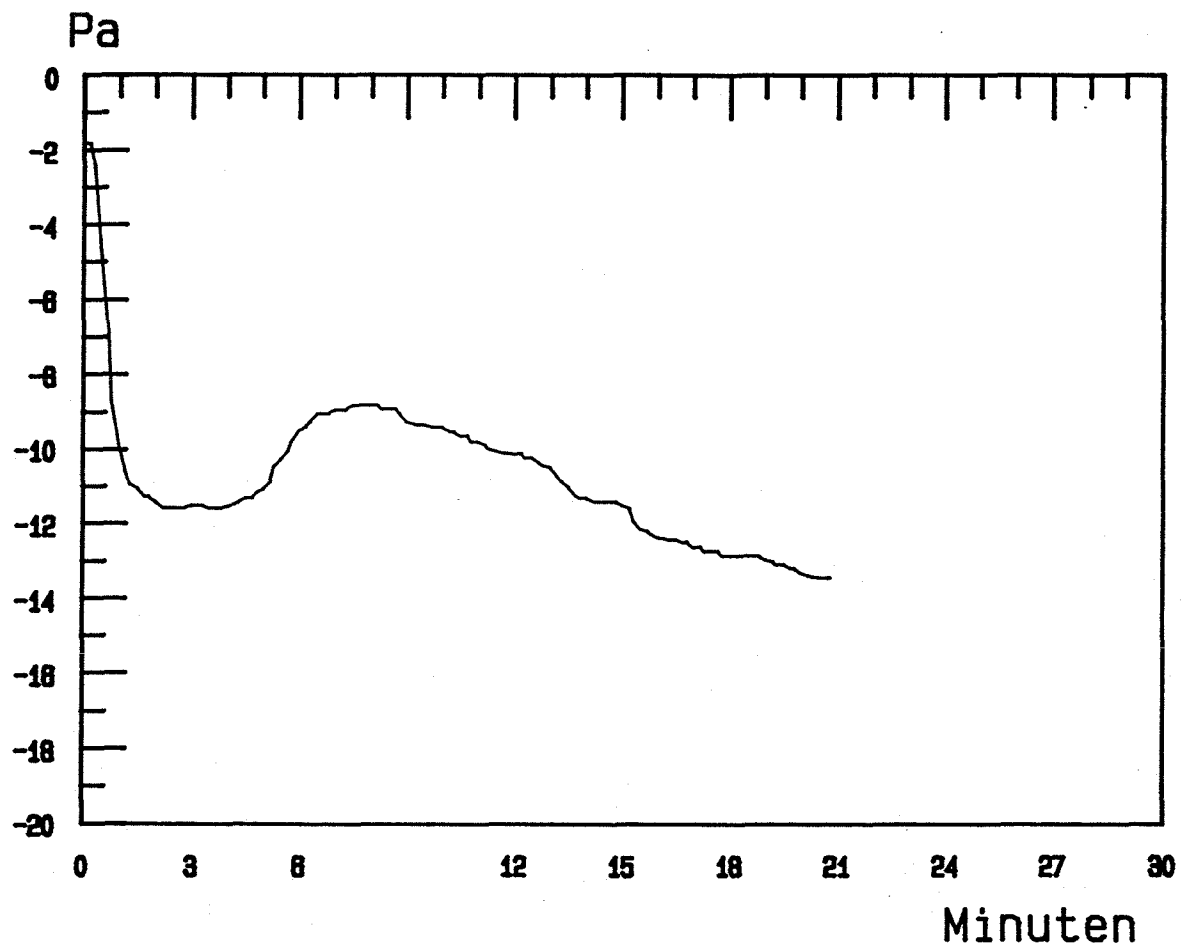
Temperaturen der Meßstellen 1 bis 27 bei Versuch 41.1

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 21.9 | 21.7 | 21.5 |
| 1.00 | 32.3 | 31.1 | 27.0 |
| 2.00 | 77.7 | 69.5 | 61.2 |
| 3.00 | 103.6 | 96.8 | 88.6 |
| 4.00 | 182.5 | 159.5 | 142.8 |
| 5.00 | 240.0 | 215.4 | 181.1 |
| 6.00 | 269.7 | 261.9 | 250.4 |
| 7.00 | 266.1 | 250.9 | 217.6 |
| 8.00 | 213.1 | 205.9 | 187.2 |
| 9.00 | 157.8 | 157.1 | 140.3 |
| 10.00 | 130.1 | 131.6 | 117.4 |
| 11.00 | 113.5 | 117.7 | 103.9 |
| 12.00 | 99.0 | 104.0 | 92.2 |
| 13.00 | 91.0 | 95.7 | 85.4 |
| 14.00 | 81.8 | 86.9 | 77.4 |
| 15.00 | 73.0 | 78.5 | 71.8 |
| 16.00 | 69.4 | 74.3 | 66.9 |
| 17.00 | 62.1 | 66.9 | 61.7 |
| 18.00 | 56.9 | 61.6 | 58.0 |
| 19.00 | 52.6 | 56.1 | 55.2 |
| 20.00 | 49.5 | 52.1 | 51.3 |

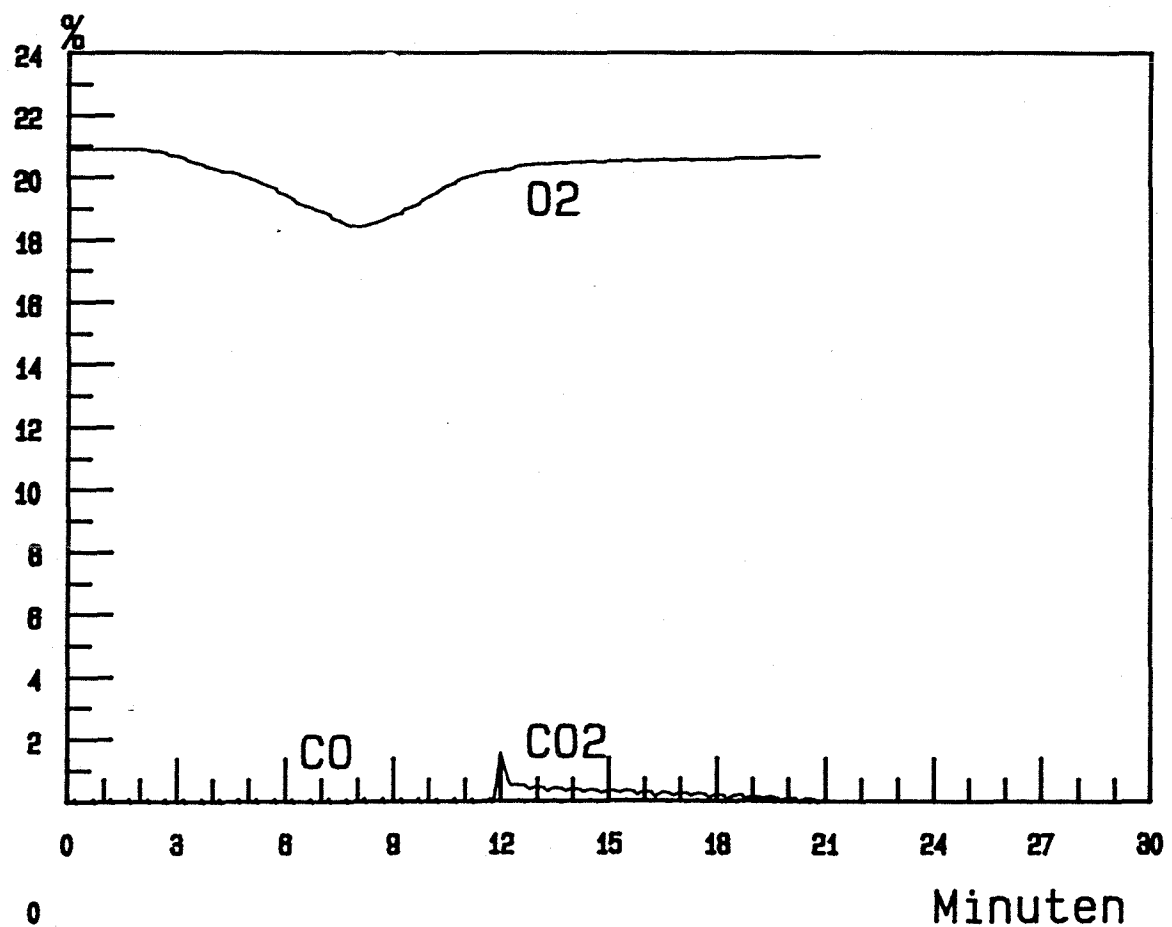
Temperaturen der Meßstellen 28 bis 30 bei Versuch 41.1



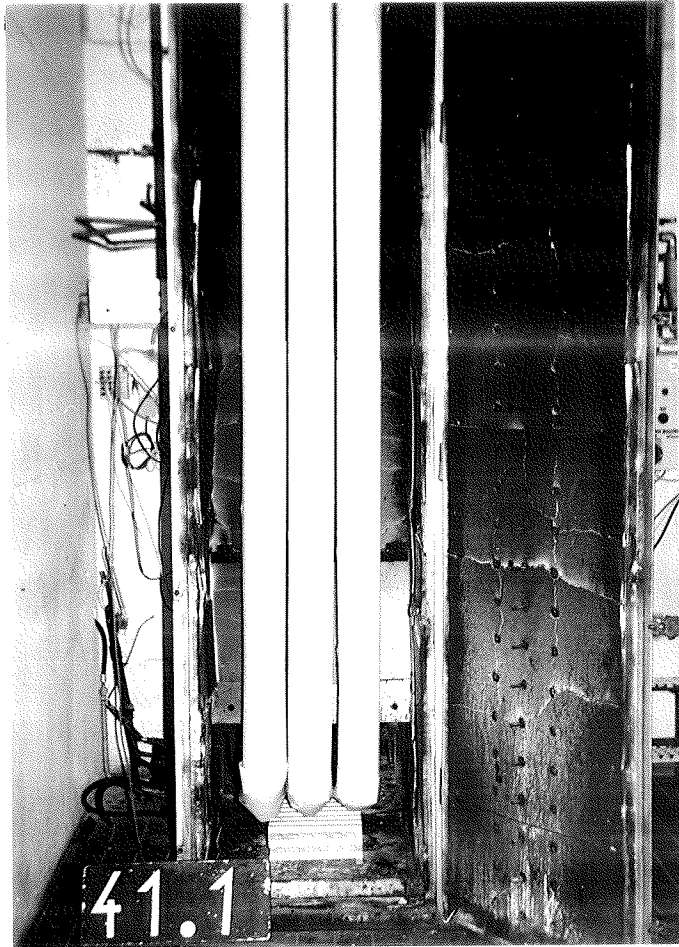
Temperatur und Flammenhoehe bei Versuch 41.1



Druckverlauf im Brandraum bei Versuch 41.1



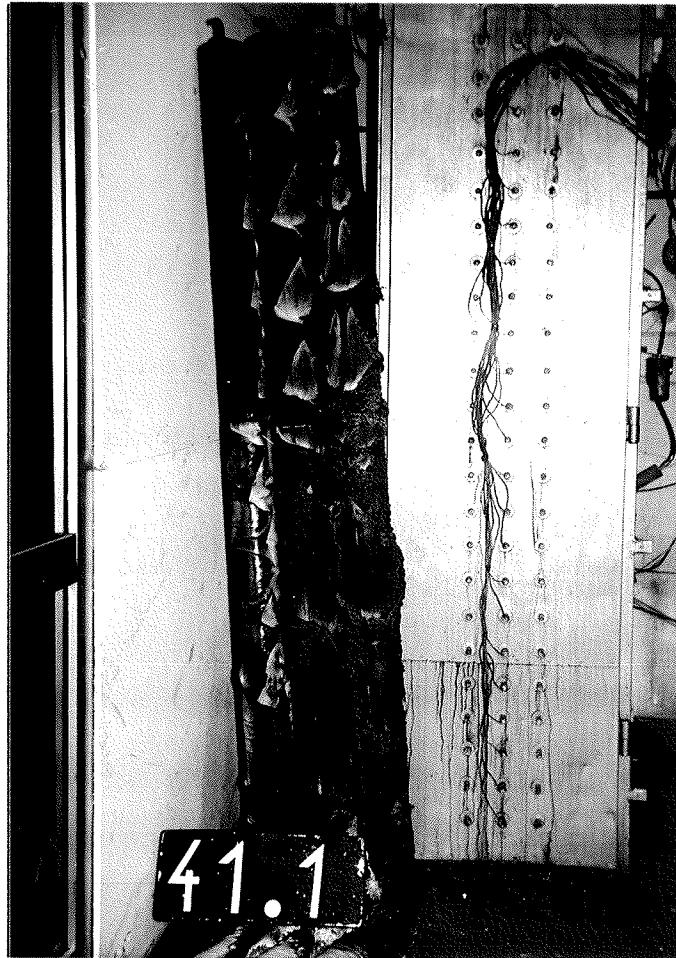
CO₂, CO, O₂-Gehalt bei Versuch 41.1



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch



Sicht auf die Rohrisolierungen nach dem Versuch 41.1

Versuch Nr. : 41.2

Materialbeschreibung

Material Nr. 8.1 : ISOVER MIFA mit PVC-Folienkaschierung

Abmessungen

Innendurchmesser/Außendurchmesser: 61 mm/124 mm

Wanddicke : 31,5 mm

Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 41.2 am 03.11.1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung des Gasbrenners. |
| 1' 00" | Im Bereich des Knies verformt sich die Kaschierung (schrumpft zusammen) |
| 2' 00" | Flammenhöhe geht zurück. |
| 14' 00" | Im Bereich des Knies ist die Kaschierung angekohlt. |
| 14'- 20' | Keine weiteren Veränderungen am Material. |
| 20' 00" | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge: Probe 1) 1300 mm
Probe 2) 950 mm **Mittelwert = 1066 mm**
Probe 3) 950 mm

Das Folienmaterial ist bis zu einer durchschnittlichen Restlänge von 1066 cm verbrannt bzw. karbonisiert. An dem darunter liegenden Dämmstoff aus Mineralfaser ist bis auf eine weiße Einfärbung des Materials keine Veränderung festzustellen.

| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 5.3 | 32.2 | 11.7 | 15.5 | 17.8 | 22.1 | 31.1 | 33.9 | 82.8 | 107.8 | 120.0 | 116.0 | 87.8 | 93.2 |
| 1.00 | 5.3 | 111.6 | 19.0 | 44.8 | 74.7 | 97.4 | 151.2 | 179.3 | 270.8 | 302.6 | 301.4 | 309.1 | 300.8 | 309.1 |
| 2.00 | 5.4 | 101.5 | 18.9 | 38.6 | 105.8 | 114.3 | 143.2 | 158.5 | 161.7 | 180.3 | 197.3 | 213.6 | 213.3 | 209.3 |
| 3.00 | 5.2 | 87.6 | 18.9 | 34.9 | 115.4 | 120.1 | 141.7 | 148.4 | 141.5 | 151.2 | 166.8 | 172.8 | 174.3 | 167.9 |
| 4.00 | 5.9 | 83.9 | 20.0 | 34.5 | 114.0 | 119.4 | 145.7 | 148.5 | 157.2 | 186.8 | 180.0 | 173.5 | 168.9 | 170.1 |
| 5.00 | 5.5 | 94.6 | 21.6 | 40.6 | 139.3 | 134.2 | 157.0 | 158.6 | 148.4 | 156.0 | 170.0 | 183.5 | 181.0 | 184.9 |
| 6.00 | 5.4 | 97.6 | 21.9 | 45.1 | 135.2 | 139.0 | 173.6 | 181.9 | 186.6 | 197.4 | 196.5 | 202.7 | 199.4 | 207.2 |
| 7.00 | 5.3 | 106.5 | 24.9 | 45.0 | 143.8 | 143.7 | 175.4 | 187.0 | 192.8 | 208.0 | 207.3 | 229.1 | 217.5 | 223.1 |
| 8.00 | 5.1 | 112.1 | 25.2 | 52.1 | 160.8 | 158.8 | 188.2 | 201.6 | 188.1 | 199.6 | 199.3 | 207.6 | 214.0 | 214.1 |
| 9.00 | 5.3 | 117.5 | 26.6 | 47.7 | 168.2 | 165.8 | 200.7 | 211.2 | 220.5 | 223.1 | 216.9 | 234.5 | 227.9 | 227.2 |
| 10.00 | 5.5 | 120.3 | 28.5 | 51.8 | 160.6 | 164.7 | 203.0 | 219.4 | 219.1 | 242.7 | 245.6 | 253.8 | 247.4 | 258.7 |
| 11.00 | 5.5 | 121.6 | 30.3 | 56.7 | 176.6 | 167.7 | 205.4 | 219.2 | 221.6 | 234.0 | 243.4 | 256.3 | 248.4 | 251.8 |
| 12.00 | 5.2 | 120.4 | 30.1 | 54.6 | 161.3 | 163.6 | 207.1 | 235.3 | 253.8 | 251.3 | 253.7 | 267.4 | 256.0 | 262.4 |
| 13.00 | 5.2 | 118.2 | 31.9 | 51.4 | 176.0 | 169.2 | 210.8 | 230.2 | 231.0 | 249.2 | 246.7 | 254.2 | 245.9 | 250.0 |
| 14.00 | 5.2 | 119.9 | 31.5 | 50.5 | 170.9 | 169.2 | 203.6 | 219.5 | 213.9 | 238.5 | 234.9 | 252.4 | 247.7 | 250.9 |
| 15.00 | 5.0 | 120.3 | 32.5 | 55.0 | 158.9 | 163.7 | 207.4 | 224.8 | 234.7 | 236.2 | 239.1 | 249.6 | 247.6 | 259.7 |
| 16.00 | 5.4 | 120.1 | 33.8 | 57.6 | 170.0 | 168.1 | 205.2 | 220.0 | 210.7 | 226.1 | 239.7 | 250.1 | 239.0 | 239.0 |
| 17.00 | 5.0 | 116.9 | 34.3 | 58.3 | 167.0 | 168.0 | 205.7 | 220.8 | 213.8 | 229.5 | 239.2 | 255.1 | 245.8 | 256.4 |
| 18.00 | 5.2 | 121.5 | 35.9 | 56.6 | 175.9 | 173.8 | 208.1 | 221.6 | 224.9 | 227.1 | 223.1 | 238.9 | 238.9 | 242.2 |
| 19.00 | 5.4 | 121.5 | 34.8 | 58.0 | 170.4 | 166.8 | 204.3 | 224.1 | 232.2 | 247.7 | 239.7 | 249.6 | 248.3 | 247.8 |

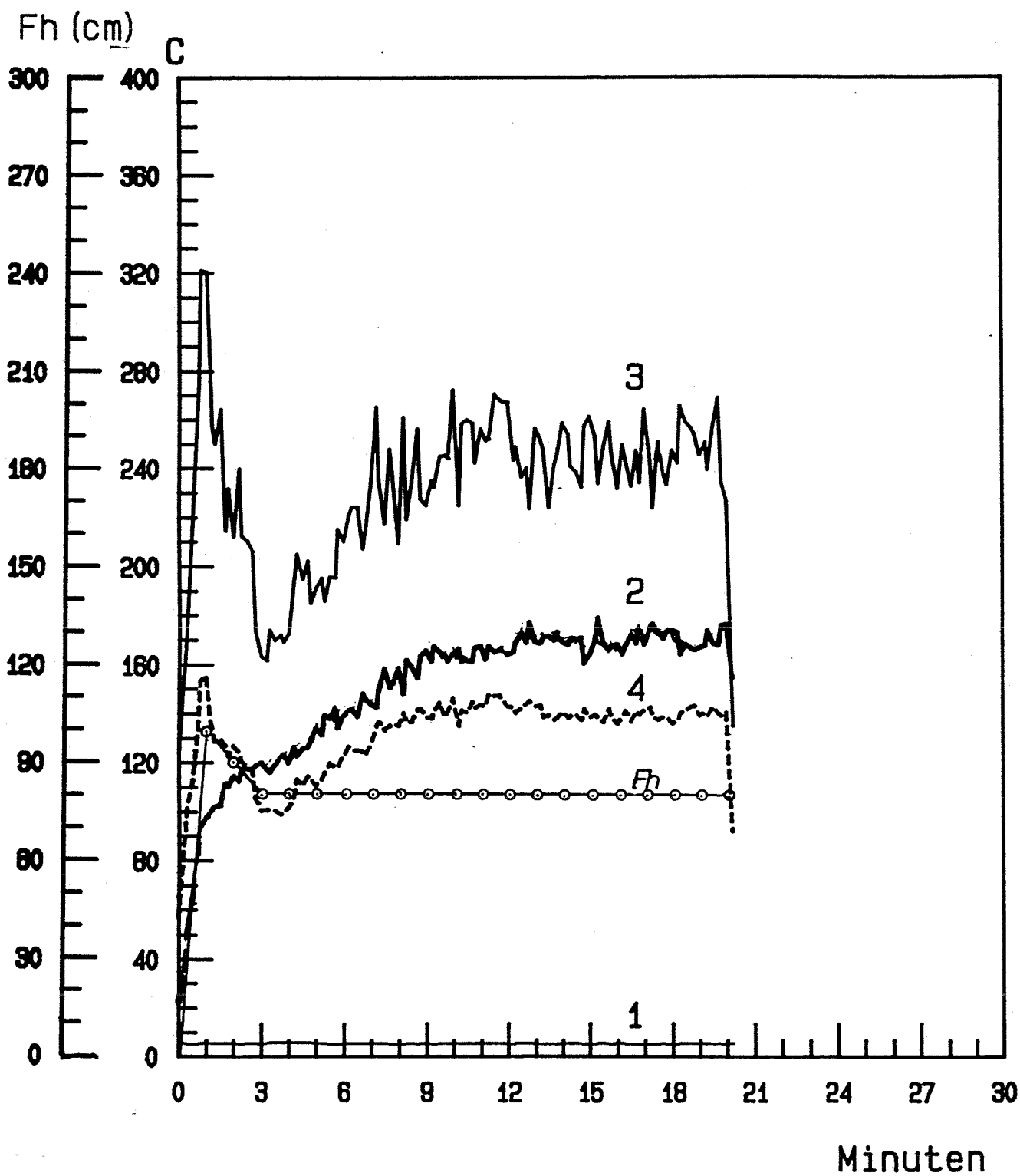
| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 125.0 | 127.2 | 111.5 | 97.8 | 71.5 | 106.7 | 79.0 | 86.5 | 96.8 | 77.6 | 95.3 | 89.5 | 74.0 |
| 1.00 | 320.3 | 341.5 | 328.6 | 300.1 | 248.2 | 272.2 | 230.1 | 248.3 | 236.9 | 204.4 | 219.8 | 211.6 | 183.9 |
| 2.00 | 212.3 | 213.1 | 211.1 | 206.1 | 192.2 | 193.5 | 179.4 | 179.9 | 174.0 | 163.4 | 163.8 | 158.4 | 146.7 |
| 3.00 | 163.2 | 155.7 | 153.9 | 147.7 | 148.6 | 138.1 | 139.4 | 134.2 | 131.9 | 130.4 | 123.3 | 119.8 | 115.5 |
| 4.00 | 172.8 | 173.7 | 170.4 | 163.8 | 154.2 | 152.5 | 143.1 | 141.8 | 136.8 | 130.3 | 127.2 | 122.8 | 117.1 |
| 5.00 | 191.1 | 189.4 | 183.0 | 175.4 | 162.9 | 160.4 | 151.5 | 150.3 | 146.6 | 138.1 | 135.5 | 131.0 | 122.6 |
| 6.00 | 210.5 | 216.9 | 210.3 | 201.0 | 184.2 | 188.4 | 172.9 | 176.0 | 170.0 | 158.2 | 159.1 | 153.8 | 142.7 |
| 7.00 | 233.0 | 236.5 | 227.2 | 214.3 | 195.0 | 196.2 | 180.0 | 176.0 | 171.1 | 159.8 | 159.1 | 153.9 | 144.5 |
| 8.00 | 209.6 | 216.9 | 214.4 | 207.4 | 195.9 | 191.3 | 182.1 | 181.7 | 176.3 | 168.9 | 167.9 | 164.2 | 155.0 |
| 9.00 | 224.9 | 225.1 | 218.6 | 210.2 | 199.0 | 194.8 | 186.6 | 186.7 | 179.8 | 171.4 | 169.6 | 165.9 | 156.1 |
| 10.00 | 272.1 | 271.8 | 257.8 | 243.7 | 220.3 | 224.4 | 204.4 | 204.8 | 199.5 | 186.5 | 187.0 | 180.4 | 170.5 |
| 11.00 | 256.2 | 254.0 | 241.4 | 232.5 | 216.4 | 214.0 | 199.9 | 195.4 | 190.4 | 181.6 | 179.0 | 172.4 | 164.4 |
| 12.00 | 267.2 | 272.6 | 262.7 | 246.8 | 224.2 | 224.9 | 206.9 | 204.6 | 193.8 | 183.0 | 180.5 | 171.6 | 161.8 |
| 13.00 | 256.5 | 251.8 | 246.6 | 235.4 | 219.3 | 217.9 | 205.0 | 203.4 | 195.7 | 184.6 | 183.5 | 176.7 | 166.2 |
| 14.00 | 258.6 | 262.1 | 248.7 | 234.1 | 215.6 | 212.0 | 197.2 | 194.3 | 188.1 | 179.6 | 177.6 | 170.6 | 160.9 |
| 15.00 | 261.1 | 260.0 | 243.3 | 226.9 | 208.0 | 204.6 | 190.9 | 190.1 | 183.0 | 175.6 | 172.9 | 163.9 | 155.6 |
| 16.00 | 231.7 | 230.8 | 221.4 | 212.9 | 202.5 | 195.5 | 186.6 | 184.6 | 177.7 | 170.9 | 166.3 | 158.9 | 150.9 |
| 17.00 | 264.3 | 267.2 | 251.2 | 239.0 | 218.7 | 220.3 | 201.7 | 199.0 | 193.7 | 180.5 | 181.6 | 174.0 | 164.0 |
| 18.00 | 247.2 | 242.6 | 231.2 | 220.3 | 203.4 | 198.4 | 187.9 | 186.7 | 179.4 | 170.7 | 167.8 | 161.4 | 151.4 |
| 19.00 | 245.4 | 242.0 | 234.2 | 221.3 | 208.6 | 204.2 | 193.3 | 189.3 | 182.4 | 175.7 | 172.6 | 165.4 | 156.8 |

Temperaturen der Meßstellen 1 bis 27
bei Versuch Nr. 41.2

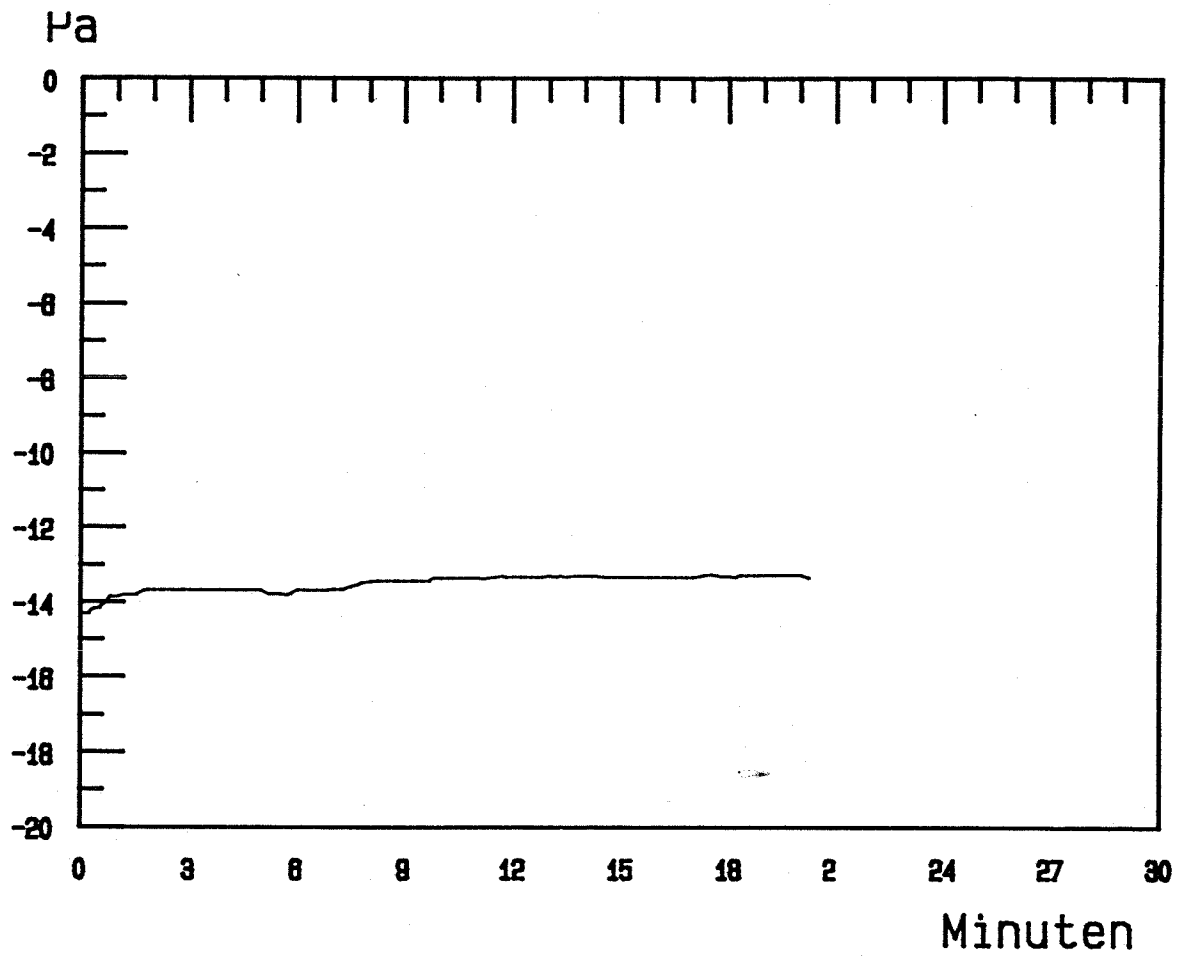
Zeit/Mst 28 29 30
(min)

| | | | |
|-------|-------|-------|-------|
| 0.00 | 75.4 | 54.5 | 39.9 |
| 1.00 | 192.0 | 149.8 | 124.4 |
| 2.00 | 149.0 | 124.1 | 106.6 |
| 3.00 | 114.2 | 101.4 | 84.8 |
| 4.00 | 116.6 | 101.8 | 85.4 |
| 5.00 | 124.2 | 109.4 | 97.1 |
| 6.00 | 142.8 | 121.2 | 104.4 |
| 7.00 | 144.3 | 126.3 | 111.1 |
| 8.00 | 155.0 | 134.9 | 115.3 |
| 9.00 | 156.7 | 137.8 | 121.4 |
| 10.00 | 172.6 | 147.3 | 118.5 |
| 11.00 | 163.3 | 138.8 | 128.3 |
| 12.00 | 160.7 | 141.2 | 127.1 |
| 13.00 | 165.2 | 142.5 | 121.4 |
| 14.00 | 159.4 | 138.7 | 122.7 |
| 15.00 | 154.4 | 136.0 | 123.8 |
| 16.00 | 149.7 | 133.6 | 124.1 |
| 17.00 | 162.7 | 137.8 | 124.0 |
| 18.00 | 149.7 | 134.5 | 123.5 |
| 19.00 | 154.8 | 136.2 | 126.0 |

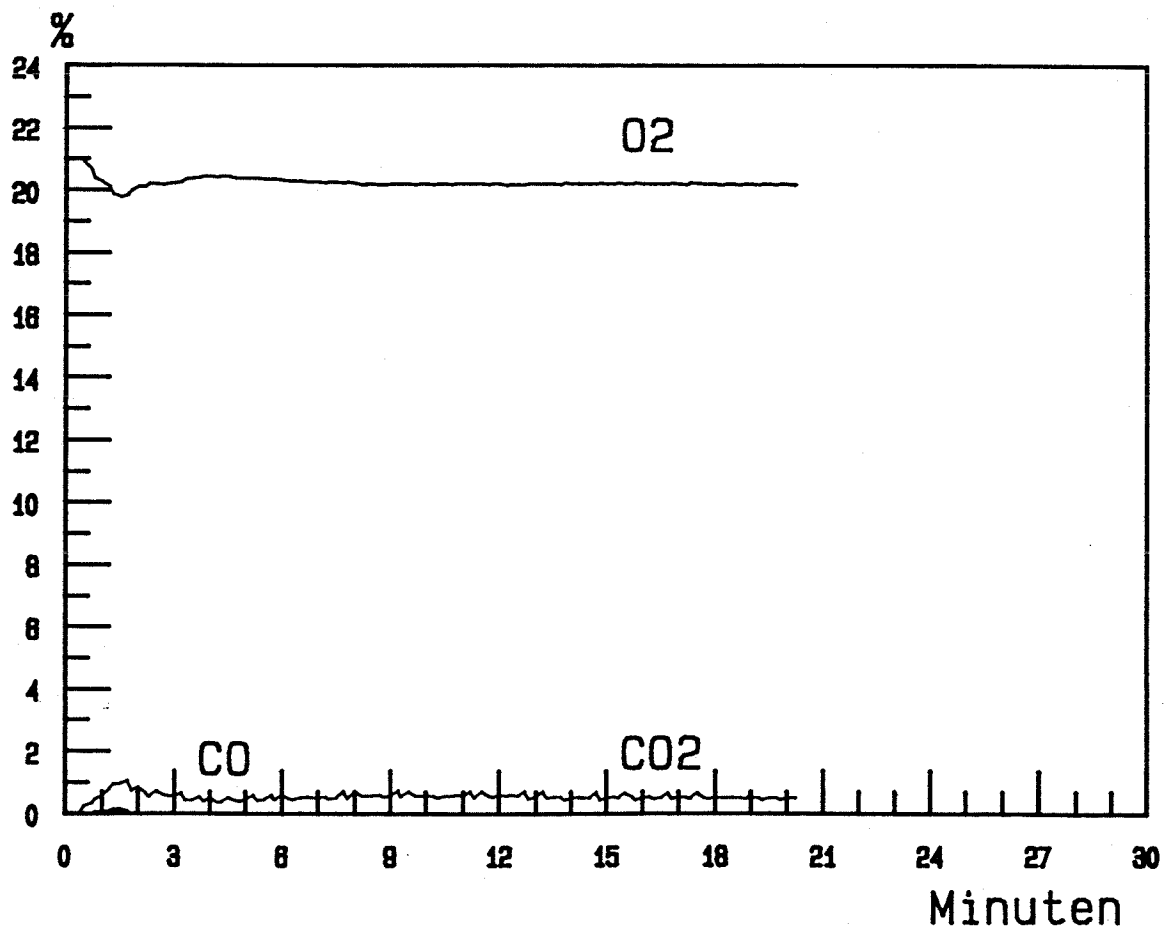
**Temperaturen der Meßstellen 28 bis 30
bei Versuch Nr. 41.2**



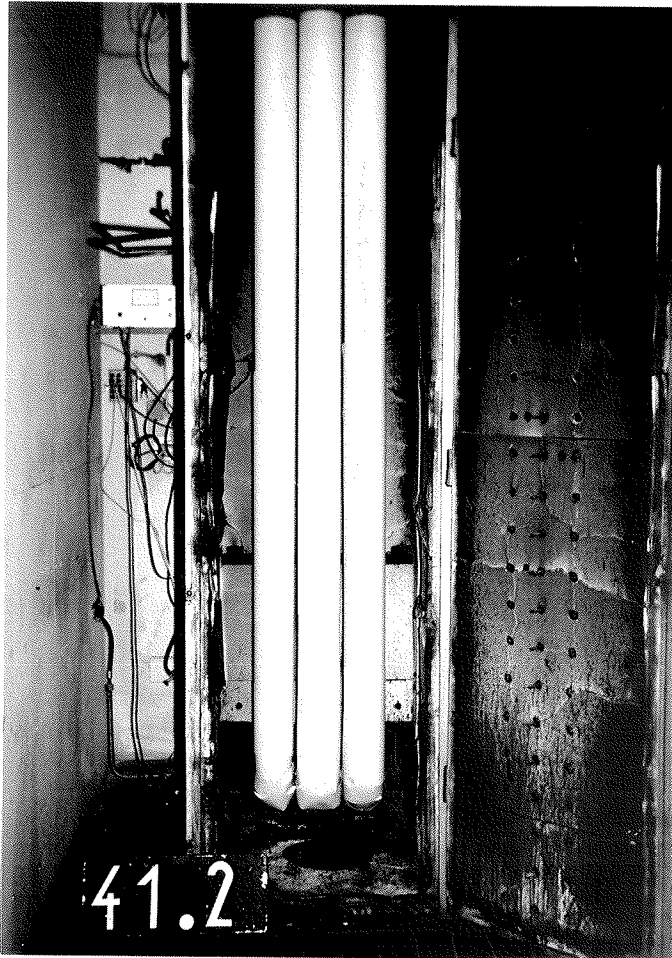
Temperatur und Flammenhoehe bei Versuch 41.1



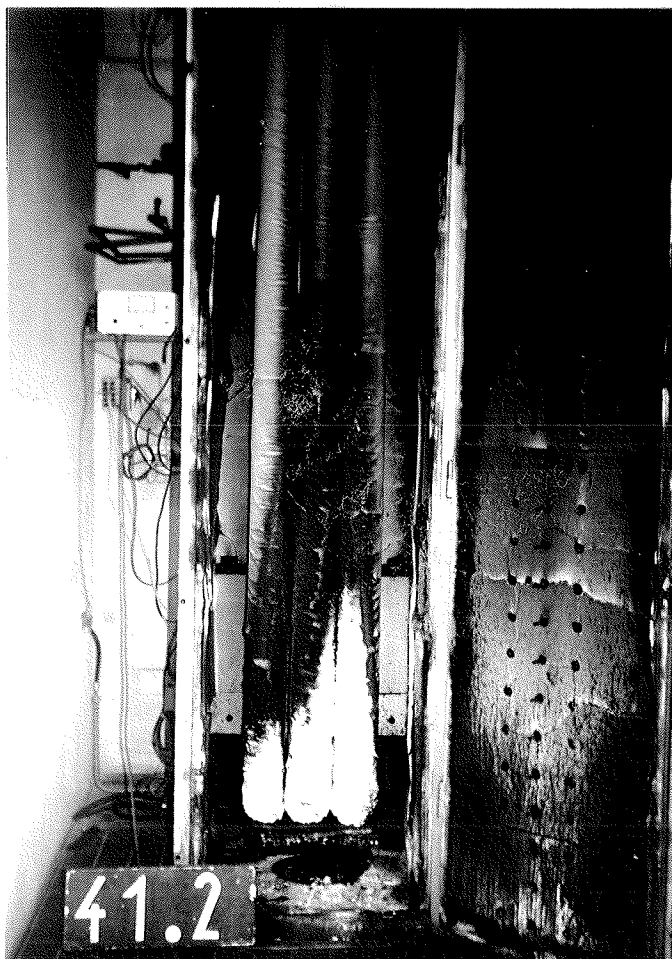
Druckverlauf im Brandraum bei Versuch 41.2



CO₂, CO, O₂-Gehalt bei Versuch 41.2



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr.: 41.3

Materialbeschreibung

Material Nr. 8.2 : ISOVER MIFA mit PVC-Folienkaschierung

Abmessungen

Innendurchmesser/Außendurchmesser: 61 mm/102 mm
Wanddicke : 20,5 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 41.3 am 09.11.1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung der Holzkrippe (2 kg) durch zwei mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 1' 00" | Im Bereich des Knies verformt sich das Material. |
| 2' 00" | Das Material kräuselt sich. |
| 6' 00" | Am horizontalen Schenkel im Bereich des Knies platzt das Material auf. |
| 7' 00" | Flammenhöhe nimmt zu. Das Material platzt weiter auf. |
| 8' 30" | Flammenhöhe nimmt ab. |
| 9' 00" | Holzstapel ausgebrannt. |
| 20' 00" | Versuchsende. |

Beobachtungen nach dem Versuch

mittlere Restlänge: 0 cm

Die Folienkaschierung ist bis zur Aufhängung teilweise verbrannt bzw. karbonisiert.

An dem darunter liegenden Dämmstoff aus Mineralfaser ist bis auf eine weiße Einfärbung des Materials keine Veränderung festzustellen.

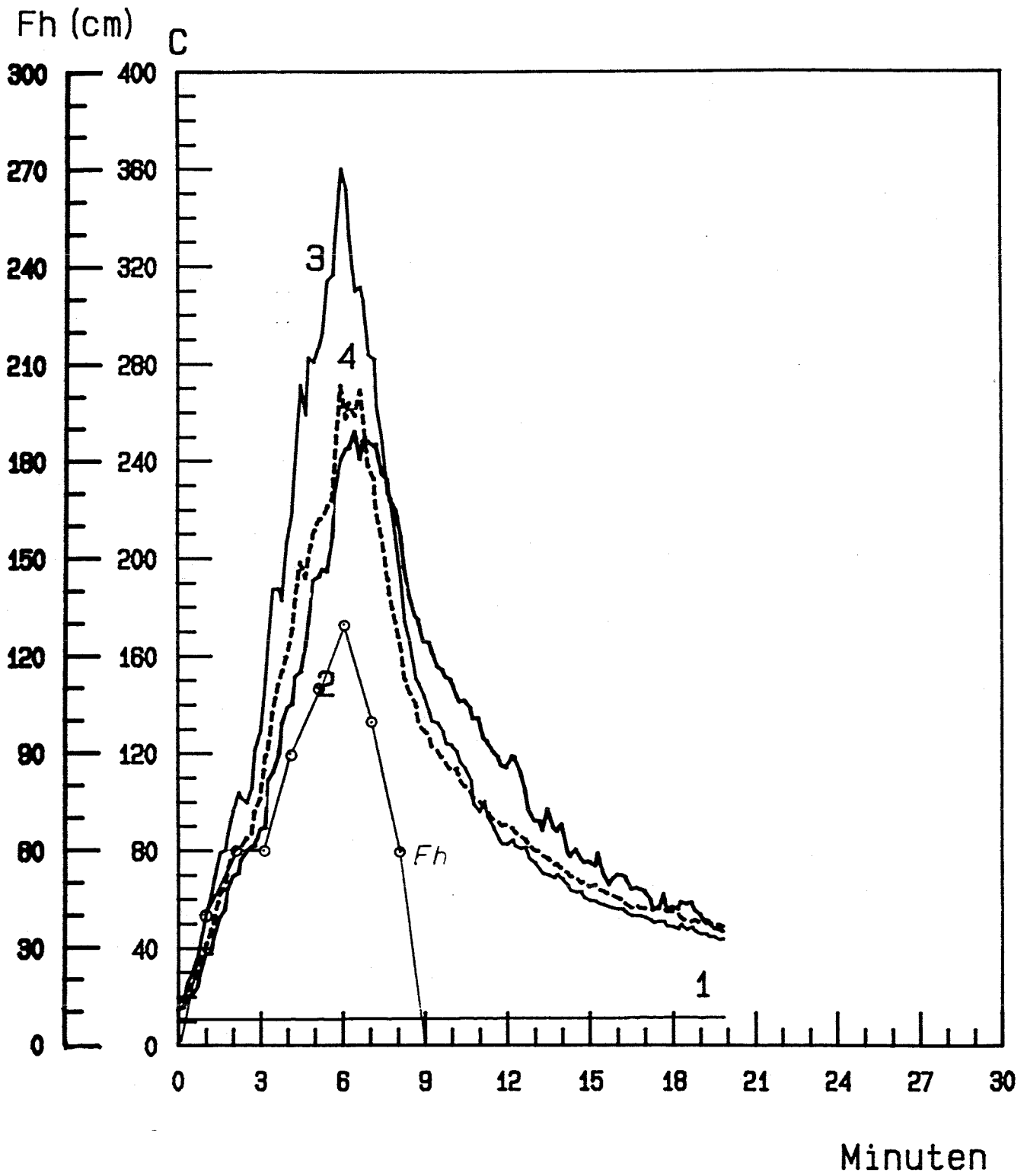
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 10.8 | 18.4 | 16.2 | 17.8 | 14.3 | 14.7 | 15.4 | 15.7 | 16.1 | 16.7 | 17.1 | 17.1 | 17.1 | 17.0 |
| 1.00 | 10.5 | 38.0 | 28.9 | 36.1 | 31.6 | 37.5 | 52.3 | 65.1 | 76.9 | 77.5 | 62.7 | 55.7 | 45.8 | 46.1 |
| 2.00 | 10.6 | 72.5 | 49.5 | 75.7 | 62.0 | 69.3 | 102.4 | 124.0 | 160.3 | 148.0 | 119.2 | 105.5 | 90.0 | 83.8 |
| 3.00 | 10.4 | 93.0 | 72.2 | 93.5 | 72.4 | 88.5 | 116.8 | 132.1 | 175.6 | 173.1 | 150.3 | 140.4 | 119.5 | 115.2 |
| 4.00 | 10.6 | 152.1 | 103.0 | 145.3 | 105.2 | 138.6 | 191.6 | 248.2 | 327.8 | 322.8 | 271.6 | 241.3 | 202.7 | 188.5 |
| 5.00 | 10.6 | 209.1 | 133.2 | 178.8 | 141.0 | 190.9 | 262.1 | 323.3 | 416.0 | 419.2 | 379.3 | 344.0 | 301.4 | 273.6 |
| 6.00 | 10.5 | 255.5 | 200.1 | 231.1 | 192.0 | 240.1 | 341.6 | 420.6 | 487.7 | 476.0 | 454.7 | 430.3 | 384.1 | 359.9 |
| 7.00 | 10.7 | 249.0 | 427.2 | 320.8 | 200.2 | 247.8 | 316.6 | 372.0 | 395.8 | 376.9 | 353.5 | 328.0 | 323.8 | 295.9 |
| 8.00 | 10.7 | 183.2 | 227.1 | 173.6 | 185.9 | 219.3 | 271.3 | 292.4 | 271.6 | 244.4 | 238.0 | 228.6 | 239.6 | 221.0 |
| 9.00 | 10.7 | 144.2 | 181.6 | 121.1 | 151.3 | 165.7 | 194.0 | 200.5 | 170.9 | 153.6 | 162.5 | 157.4 | 171.4 | 160.5 |
| 10.00 | 10.8 | 125.2 | 160.0 | 106.0 | 141.5 | 150.0 | 171.6 | 172.4 | 143.5 | 131.9 | 134.7 | 132.7 | 141.7 | 137.1 |
| 11.00 | 10.9 | 113.1 | 135.8 | 98.3 | 117.9 | 134.3 | 155.1 | 147.7 | 113.1 | 95.1 | 102.5 | 104.0 | 116.5 | 108.4 |
| 12.00 | 10.9 | 100.3 | 126.1 | 92.8 | 103.8 | 113.8 | 136.4 | 124.3 | 93.7 | 78.4 | 86.8 | 88.0 | 98.0 | 92.4 |
| 13.00 | 11.0 | 88.8 | 105.4 | 90.9 | 94.3 | 91.8 | 101.6 | 98.8 | 72.1 | 66.7 | 76.9 | 77.7 | 87.7 | 83.6 |
| 14.00 | 11.1 | 80.2 | 102.2 | 73.0 | 90.8 | 90.8 | 101.6 | 97.3 | 76.4 | 65.9 | 69.9 | 70.6 | 78.0 | 75.5 |
| 15.00 | 11.1 | 71.4 | 88.8 | 77.2 | 74.8 | 75.2 | 79.9 | 73.4 | 54.1 | 50.3 | 59.3 | 60.3 | 68.6 | 66.0 |
| 16.00 | 11.1 | 65.8 | 83.5 | 67.5 | 69.1 | 70.0 | 77.0 | 74.0 | 57.7 | 52.3 | 56.0 | 56.1 | 62.8 | 60.5 |
| 17.00 | 11.2 | 61.5 | 75.1 | 56.9 | 65.5 | 63.4 | 68.9 | 66.3 | 51.1 | 46.8 | 51.7 | 52.5 | 58.3 | 56.1 |
| 18.00 | 11.3 | 57.4 | 73.3 | 60.8 | 57.4 | 56.9 | 63.2 | 59.4 | 44.2 | 41.1 | 46.7 | 47.8 | 53.9 | 51.7 |
| 19.00 | 11.2 | 54.8 | 69.0 | 56.4 | 52.6 | 53.8 | 60.3 | 56.8 | 42.9 | 39.4 | 44.9 | 45.5 | 51.0 | 48.4 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 17.2 | 17.7 | 17.6 | 17.6 | 17.5 | 18.2 | 18.0 | 18.5 | 18.4 | 17.9 | 18.6 | 18.7 | 18.7 |
| 1.00 | 54.1 | 57.9 | 53.5 | 49.5 | 40.9 | 49.9 | 40.1 | 46.0 | 46.1 | 38.3 | 45.9 | 45.4 | 40.7 |
| 2.00 | 96.0 | 100.4 | 93.2 | 85.6 | 72.1 | 86.5 | 71.9 | 83.6 | 84.3 | 72.2 | 86.3 | 86.7 | 76.4 |
| 3.00 | 129.4 | 132.6 | 124.9 | 116.5 | 99.3 | 119.8 | 101.5 | 114.6 | 115.2 | 99.2 | 113.9 | 113.4 | 100.1 |
| 4.00 | 206.3 | 210.7 | 199.9 | 188.9 | 166.1 | 192.1 | 167.0 | 186.2 | 185.1 | 159.4 | 181.9 | 181.8 | 160.2 |
| 5.00 | 280.4 | 279.7 | 264.0 | 245.5 | 219.6 | 244.5 | 220.7 | 240.0 | 238.7 | 211.7 | 235.1 | 235.6 | 211.0 |
| 6.00 | 360.0 | 365.5 | 345.6 | 326.5 | 292.5 | 325.3 | 291.1 | 313.0 | 314.0 | 278.7 | 308.4 | 308.4 | 277.5 |
| 7.00 | 283.4 | 279.3 | 272.1 | 263.3 | 257.1 | 254.3 | 248.3 | 254.2 | 249.4 | 243.7 | 244.5 | 244.0 | 230.4 |
| 8.00 | 204.7 | 191.8 | 190.7 | 188.2 | 195.8 | 183.2 | 192.7 | 186.9 | 185.9 | 193.0 | 179.7 | 177.3 | 176.6 |
| 9.00 | 143.7 | 129.8 | 132.5 | 130.7 | 142.1 | 128.0 | 140.7 | 130.0 | 130.7 | 145.3 | 129.6 | 128.6 | 132.8 |
| 10.00 | 123.4 | 115.6 | 117.0 | 114.4 | 120.1 | 112.1 | 120.0 | 113.3 | 113.1 | 122.2 | 111.5 | 111.1 | 114.1 |
| 11.00 | 95.7 | 87.5 | 89.6 | 89.1 | 97.2 | 87.4 | 98.4 | 92.4 | 92.7 | 103.5 | 94.3 | 95.6 | 99.5 |
| 12.00 | 82.5 | 74.5 | 76.9 | 76.5 | 83.7 | 75.5 | 85.8 | 80.1 | 81.8 | 90.7 | 83.9 | 86.5 | 89.3 |
| 13.00 | 74.9 | 69.3 | 71.1 | 70.3 | 75.2 | 69.0 | 76.4 | 72.2 | 72.6 | 81.0 | 73.9 | 75.5 | 77.8 |
| 14.00 | 68.4 | 65.6 | 67.8 | 67.2 | 69.4 | 67.2 | 70.4 | 67.6 | 68.5 | 73.4 | 68.8 | 69.0 | 70.8 |
| 15.00 | 59.4 | 55.9 | 57.9 | 58.0 | 60.9 | 56.8 | 61.1 | 57.8 | 58.5 | 64.4 | 59.1 | 59.5 | 62.1 |
| 16.00 | 55.9 | 53.1 | 54.7 | 54.5 | 56.8 | 54.1 | 56.7 | 54.4 | 55.4 | 59.7 | 55.7 | 56.6 | 58.2 |
| 17.00 | 52.6 | 51.1 | 52.4 | 52.1 | 53.3 | 51.0 | 52.8 | 51.6 | 52.1 | 55.3 | 52.5 | 52.8 | 54.0 |
| 18.00 | 48.8 | 47.0 | 48.2 | 48.0 | 49.9 | 47.5 | 49.5 | 48.2 | 48.8 | 51.9 | 49.4 | 50.2 | 51.7 |
| 19.00 | 45.8 | 44.1 | 45.2 | 45.1 | 46.7 | 43.7 | 46.1 | 44.7 | 45.2 | 48.4 | 45.7 | 46.0 | 47.8 |

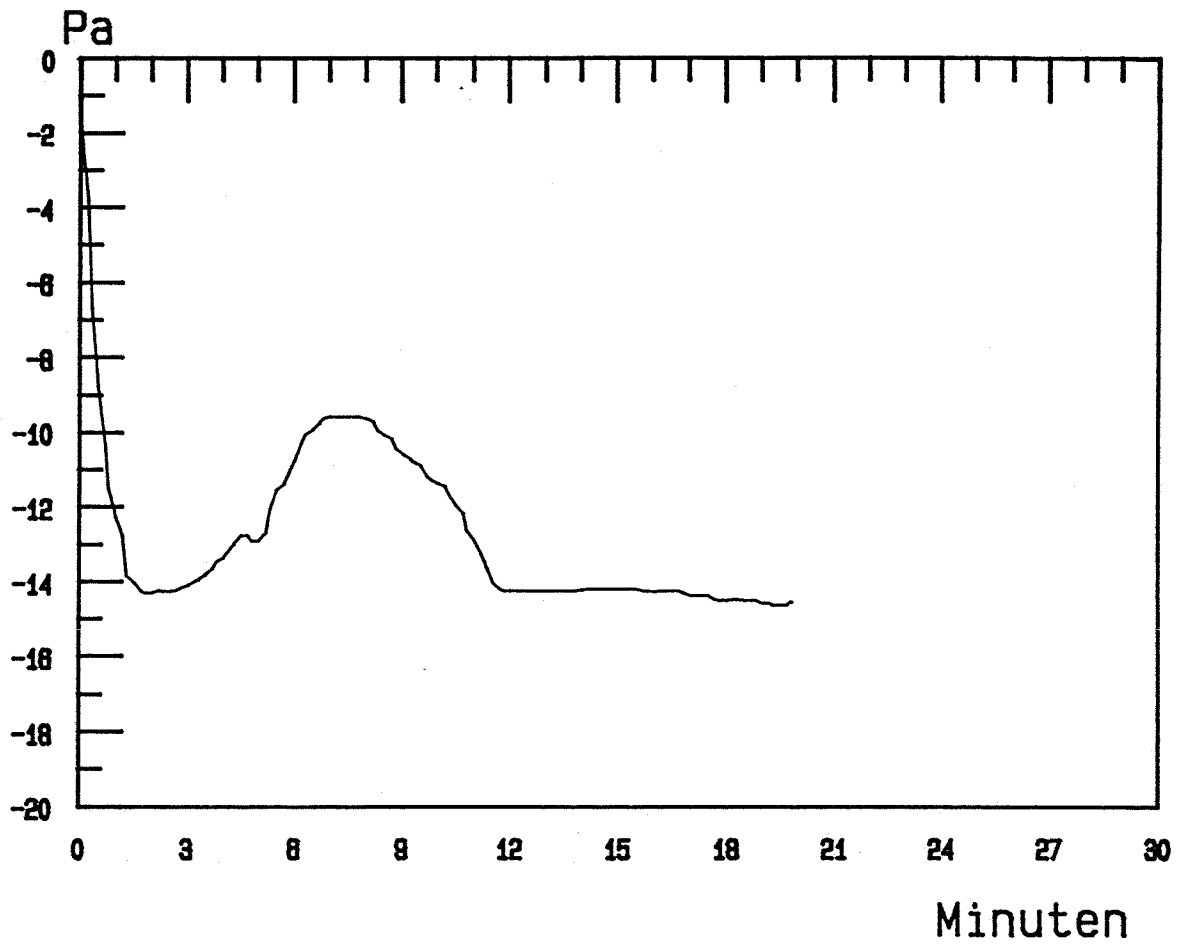
Temperaturen der Meßstellen 1 bis 27 bei Versuch 41.3

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 18.9 | 19.3 | 19.0 |
| 1.00 | 43.3 | 41.6 | 37.5 |
| 2.00 | 82.6 | 79.2 | 74.8 |
| 3.00 | 106.2 | 103.0 | 93.9 |
| 4.00 | 168.8 | 164.5 | 146.7 |
| 5.00 | 220.8 | 219.8 | 188.8 |
| 6.00 | 290.3 | 269.8 | 251.7 |
| 7.00 | 235.6 | 233.3 | 244.0 |
| 8.00 | 174.4 | 175.3 | 165.7 |
| 9.00 | 129.4 | 134.7 | 123.4 |
| 10.00 | 111.0 | 118.2 | 107.9 |
| 11.00 | 98.1 | 104.1 | 97.2 |
| 12.00 | 88.3 | 94.6 | 87.6 |
| 13.00 | 76.1 | 81.4 | 81.1 |
| 14.00 | 69.7 | 75.2 | 71.6 |
| 15.00 | 60.9 | 65.2 | 68.6 |
| 16.00 | 57.0 | 60.9 | 63.0 |
| 17.00 | 53.4 | 57.1 | 57.4 |
| 18.00 | 51.4 | 54.8 | 58.0 |
| 19.00 | 47.2 | 50.3 | 52.1 |

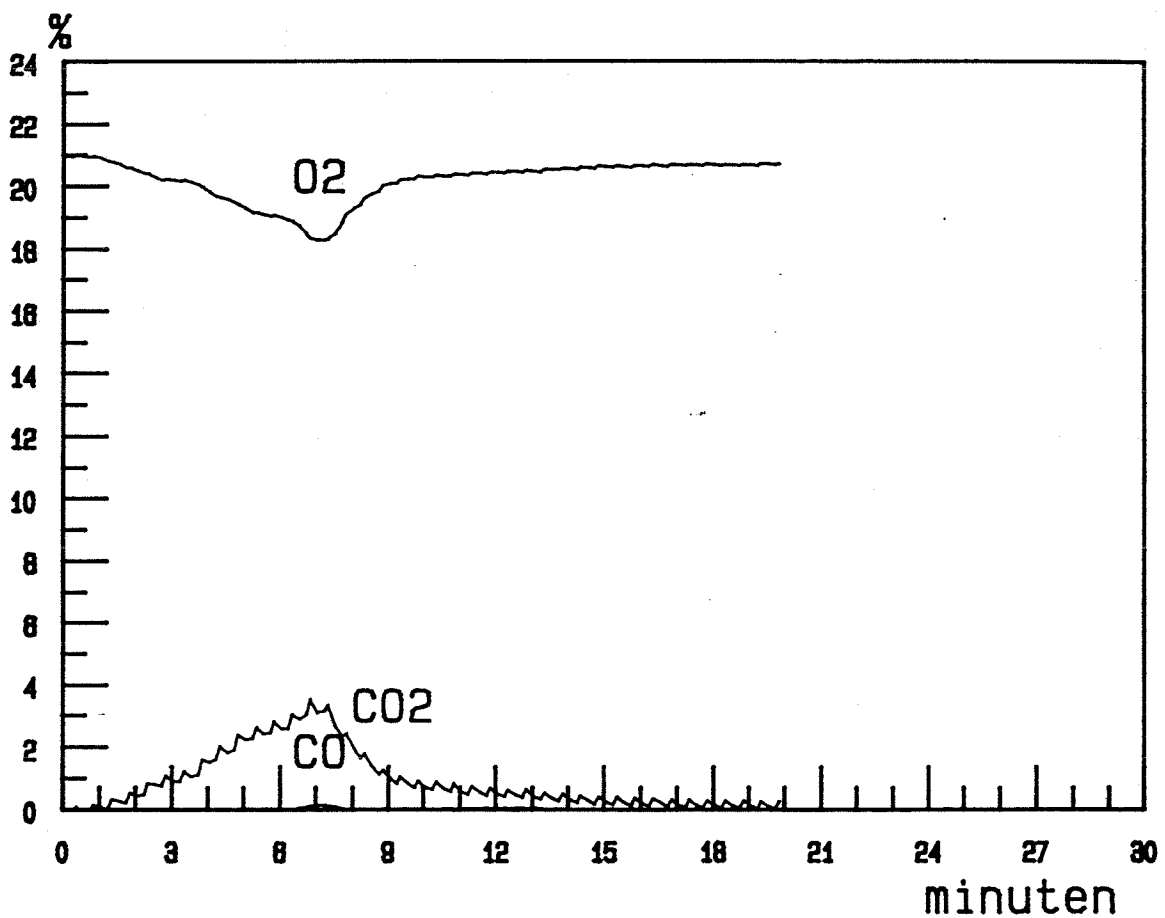
Temperaturen der Meßstellen 28 bis 30 bei Versuch 41.3



Temperatur und Flammenhoehe bei Versuch 41.3



Druckverlauf im Brandraum bei Versuch 41.3



CO2, CO, O2 Gehalt bei Versuch 41.3



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch



Sicht auf die Rohrisolierungen nach dem Versuch 41.3

Versuch Nr. : 41.4

Materialbeschreibung

Material Nr. 8.2 : ISOVER MIFA mit PVC-Folienkaschierung

Abmessungen

Innendurchmesser/Außendurchmesser: 61 mm/102 mm

Wanddicke : 20,5 mm

Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 41.4 am 07.11.1988

Zeit nach
Versuchsbeginn

Beobachtungen

| | | |
|-----|-----|---|
| 0' | | Zündung des Gasbrenners. |
| 2' | 00" | Das Material im äußeren Bereich der Probe verformt sich. |
| 6' | 00" | Im Bereich des Knies am äußeren Teil der Folienkaschierung ist das Material zusammengeschrumpft und teilweise verkohlt. |
| 7' | 00" | Am horizontalen Schenkel im Bereich des Knies ist das Material außen aufgeplatzt. |
| 20' | 00" | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge: Probe 1) 1560 mm
Probe 2) 1500 mm **Mittelwert = 1540 mm**
Probe 3) 1560 mm

Das Folienmaterial ist bis zu einer durchschnittlichen Restlänge von 1540 cm verbrannt bzw. karbonisiert.

An dem darunter liegenden Dämmstoff aus Mineralfaser ist bis auf eine weiße Einfärbung des Materials keine Veränderung festzustellen.

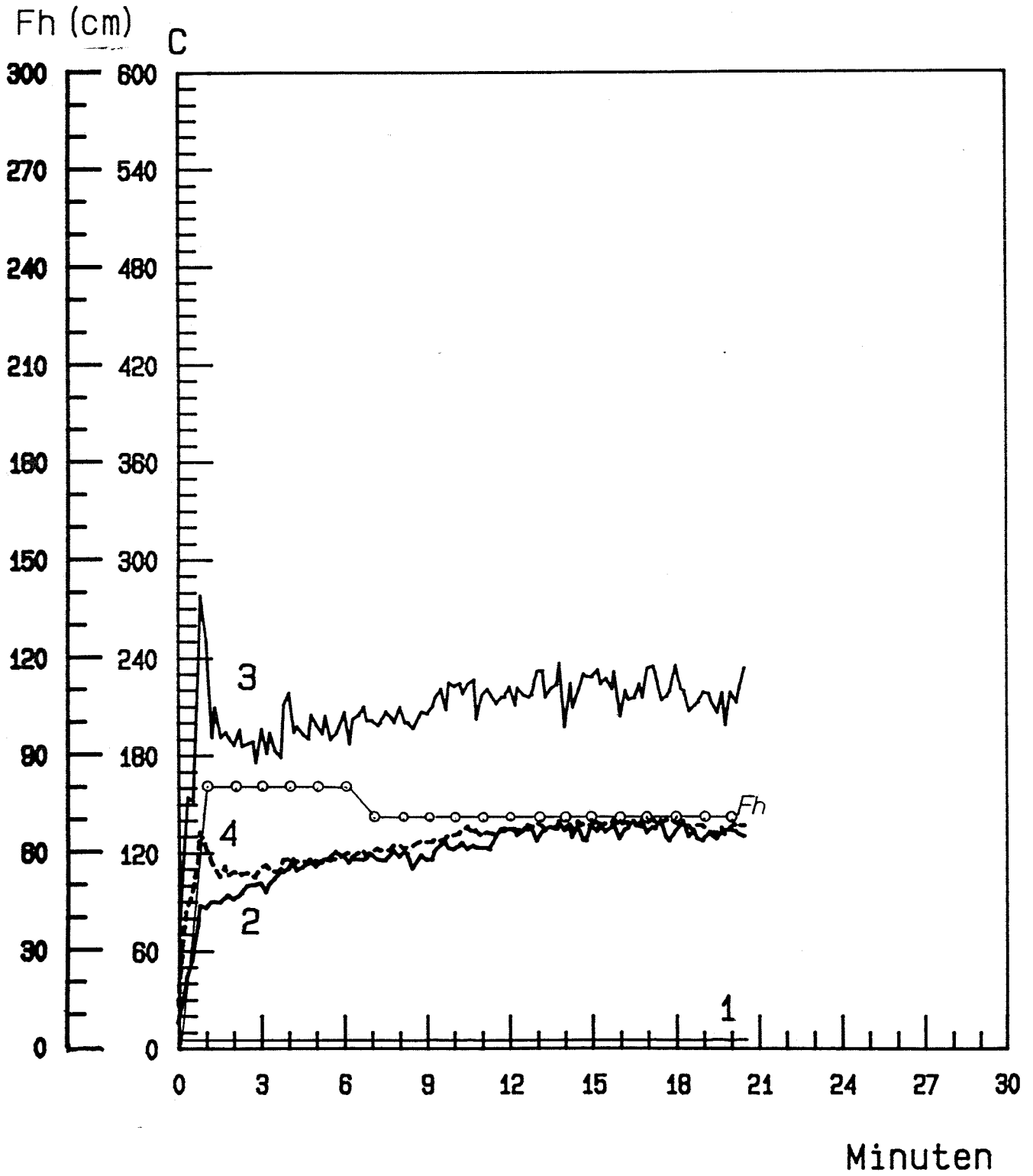
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 5.4 | 13.0 | 12.5 | 18.2 | 13.0 | 15.9 | 32.8 | 44.2 | 72.6 | 96.3 | 94.1 | 86.3 | 58.3 | 56.1 |
| 1.00 | 5.5 | 100.5 | 37.4 | 68.2 | 65.8 | 86.7 | 141.0 | 170.8 | 218.9 | 256.8 | 255.9 | 261.9 | 234.6 | 234.4 |
| 2.00 | 5.5 | 91.2 | 29.5 | 64.7 | 74.3 | 91.7 | 132.2 | 152.6 | 200.6 | 223.6 | 219.9 | 214.5 | 195.0 | 181.8 |
| 3.00 | 5.5 | 98.9 | 33.6 | 62.4 | 86.8 | 102.2 | 142.9 | 184.8 | 224.9 | 234.4 | 218.2 | 213.9 | 200.7 | 195.0 |
| 4.00 | 5.6 | 101.6 | 36.0 | 61.4 | 104.0 | 110.6 | 155.6 | 189.4 | 218.2 | 214.3 | 210.3 | 222.8 | 210.3 | 209.4 |
| 5.00 | 5.5 | 103.8 | 52.5 | 63.9 | 102.8 | 112.2 | 157.0 | 190.5 | 216.7 | 224.3 | 223.3 | 220.2 | 206.6 | 198.0 |
| 6.00 | 5.4 | 106.5 | 62.3 | 74.8 | 113.4 | 118.7 | 154.2 | 176.0 | 195.1 | 223.7 | 224.5 | 228.0 | 208.6 | 204.1 |
| 7.00 | 5.5 | 108.1 | 45.4 | 68.9 | 107.7 | 119.4 | 158.1 | 186.9 | 191.8 | 211.9 | 221.5 | 220.9 | 207.2 | 203.7 |
| 8.00 | 5.5 | 112.5 | 41.8 | 74.6 | 102.5 | 117.7 | 154.5 | 199.8 | 227.2 | 227.4 | 223.6 | 226.2 | 213.5 | 207.5 |
| 9.00 | 5.7 | 113.8 | 44.1 | 75.2 | 107.3 | 116.0 | 165.6 | 212.3 | 234.7 | 235.5 | 233.3 | 235.2 | 217.2 | 205.0 |
| 10.00 | 5.7 | 115.2 | 70.3 | 76.8 | 114.7 | 122.3 | 169.7 | 220.6 | 230.0 | 234.3 | 235.0 | 245.7 | 231.0 | 223.3 |
| 11.00 | 5.5 | 121.5 | 56.6 | 75.9 | 111.0 | 123.3 | 180.8 | 219.6 | 237.3 | 244.0 | 234.9 | 237.1 | 227.4 | 217.9 |
| 12.00 | 5.6 | 122.4 | 62.6 | 88.7 | 124.5 | 134.5 | 174.1 | 207.4 | 238.5 | 257.4 | 244.7 | 241.8 | 226.1 | 218.4 |
| 13.00 | 5.5 | 122.6 | 61.3 | 84.9 | 124.9 | 127.5 | 171.0 | 203.5 | 213.0 | 240.4 | 244.5 | 246.0 | 232.5 | 229.0 |
| 14.00 | 5.6 | 126.1 | 86.2 | 85.1 | 127.0 | 134.1 | 179.5 | 241.3 | 231.0 | 211.2 | 205.8 | 210.0 | 216.6 | 205.2 |
| 15.00 | 5.6 | 123.1 | 67.5 | 90.4 | 133.5 | 136.8 | 174.7 | 211.5 | 230.7 | 243.2 | 242.3 | 248.9 | 237.6 | 229.1 |
| 16.00 | 5.6 | 130.2 | 56.5 | 82.0 | 114.6 | 128.7 | 178.6 | 239.6 | 270.3 | 280.5 | 249.6 | 247.6 | 231.9 | 215.4 |
| 17.00 | 5.6 | 127.6 | 70.9 | 87.4 | 127.6 | 132.5 | 172.8 | 209.2 | 240.2 | 268.2 | 264.0 | 264.0 | 240.1 | 231.8 |
| 18.00 | 5.5 | 125.0 | 70.0 | 81.0 | 126.0 | 132.9 | 178.6 | 215.2 | 229.0 | 259.2 | 255.2 | 250.5 | 236.4 | 232.6 |
| 19.00 | 5.5 | 126.3 | 61.8 | 82.7 | 118.0 | 127.7 | 166.9 | 211.2 | 237.3 | 258.3 | 247.7 | 242.1 | 226.8 | 220.6 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 74.3 | 55.8 | 50.7 | 42.6 | 32.7 | 44.4 | 33.6 | 34.8 | 37.1 | 30.5 | 41.3 | 40.2 | 35.3 |
| 1.00 | 249.9 | 253.3 | 236.5 | 211.1 | 174.4 | 192.6 | 160.0 | 178.6 | 169.7 | 143.6 | 159.3 | 154.5 | 132.7 |
| 2.00 | 186.5 | 180.8 | 170.4 | 157.6 | 143.1 | 147.1 | 135.2 | 139.3 | 135.4 | 126.3 | 130.3 | 126.4 | 115.6 |
| 3.00 | 196.0 | 191.0 | 179.4 | 167.1 | 152.0 | 158.7 | 143.3 | 146.3 | 143.2 | 131.6 | 134.0 | 128.9 | 119.8 |
| 4.00 | 218.5 | 217.0 | 203.8 | 187.2 | 167.6 | 174.5 | 155.3 | 158.9 | 153.3 | 139.4 | 141.0 | 137.7 | 127.1 |
| 5.00 | 199.0 | 198.6 | 187.2 | 175.9 | 162.4 | 162.2 | 149.0 | 150.0 | 145.5 | 137.1 | 138.5 | 133.8 | 125.7 |
| 6.00 | 206.2 | 199.0 | 186.3 | 172.8 | 158.3 | 160.4 | 147.1 | 148.6 | 144.4 | 135.7 | 136.1 | 133.1 | 124.8 |
| 7.00 | 201.6 | 198.8 | 185.5 | 173.3 | 160.0 | 160.5 | 149.7 | 150.1 | 146.4 | 139.7 | 139.2 | 135.5 | 127.9 |
| 8.00 | 209.7 | 206.0 | 193.8 | 177.3 | 162.8 | 161.7 | 151.0 | 153.3 | 148.8 | 142.6 | 142.8 | 139.3 | 132.3 |
| 9.00 | 205.5 | 201.2 | 190.3 | 178.3 | 165.7 | 168.7 | 157.6 | 161.2 | 156.1 | 148.4 | 149.9 | 145.4 | 137.1 |
| 10.00 | 222.7 | 220.1 | 207.5 | 191.7 | 176.6 | 181.9 | 166.3 | 169.5 | 164.3 | 155.1 | 155.0 | 150.6 | 141.8 |
| 11.00 | 217.2 | 215.9 | 202.4 | 188.4 | 173.3 | 175.9 | 164.5 | 166.7 | 162.2 | 153.9 | 152.8 | 148.1 | 139.7 |
| 12.00 | 222.1 | 213.3 | 201.6 | 189.5 | 176.9 | 178.7 | 166.1 | 164.4 | 161.3 | 154.2 | 153.6 | 149.9 | 142.6 |
| 13.00 | 231.7 | 228.7 | 215.4 | 204.6 | 187.0 | 189.1 | 172.7 | 174.0 | 170.7 | 161.3 | 162.8 | 156.9 | 147.9 |
| 14.00 | 197.4 | 196.5 | 188.2 | 178.2 | 170.0 | 166.4 | 160.5 | 161.2 | 155.7 | 151.6 | 149.8 | 147.1 | 140.6 |
| 15.00 | 228.3 | 220.4 | 203.1 | 190.7 | 177.9 | 177.2 | 167.3 | 168.3 | 164.4 | 157.7 | 156.6 | 153.4 | 145.1 |
| 16.00 | 204.3 | 197.8 | 188.2 | 178.2 | 171.1 | 168.5 | 162.1 | 163.1 | 158.7 | 154.0 | 153.7 | 150.4 | 144.4 |
| 17.00 | 233.7 | 226.3 | 211.0 | 198.1 | 182.6 | 188.0 | 172.1 | 173.0 | 168.8 | 159.1 | 159.5 | 154.7 | 147.1 |
| 18.00 | 235.4 | 227.9 | 212.8 | 198.0 | 182.5 | 186.1 | 172.7 | 174.3 | 169.0 | 161.9 | 161.6 | 156.6 | 149.7 |
| 19.00 | 219.0 | 215.2 | 205.1 | 191.5 | 177.0 | 177.7 | 165.8 | 167.2 | 163.1 | 155.7 | 155.7 | 152.2 | 144.9 |

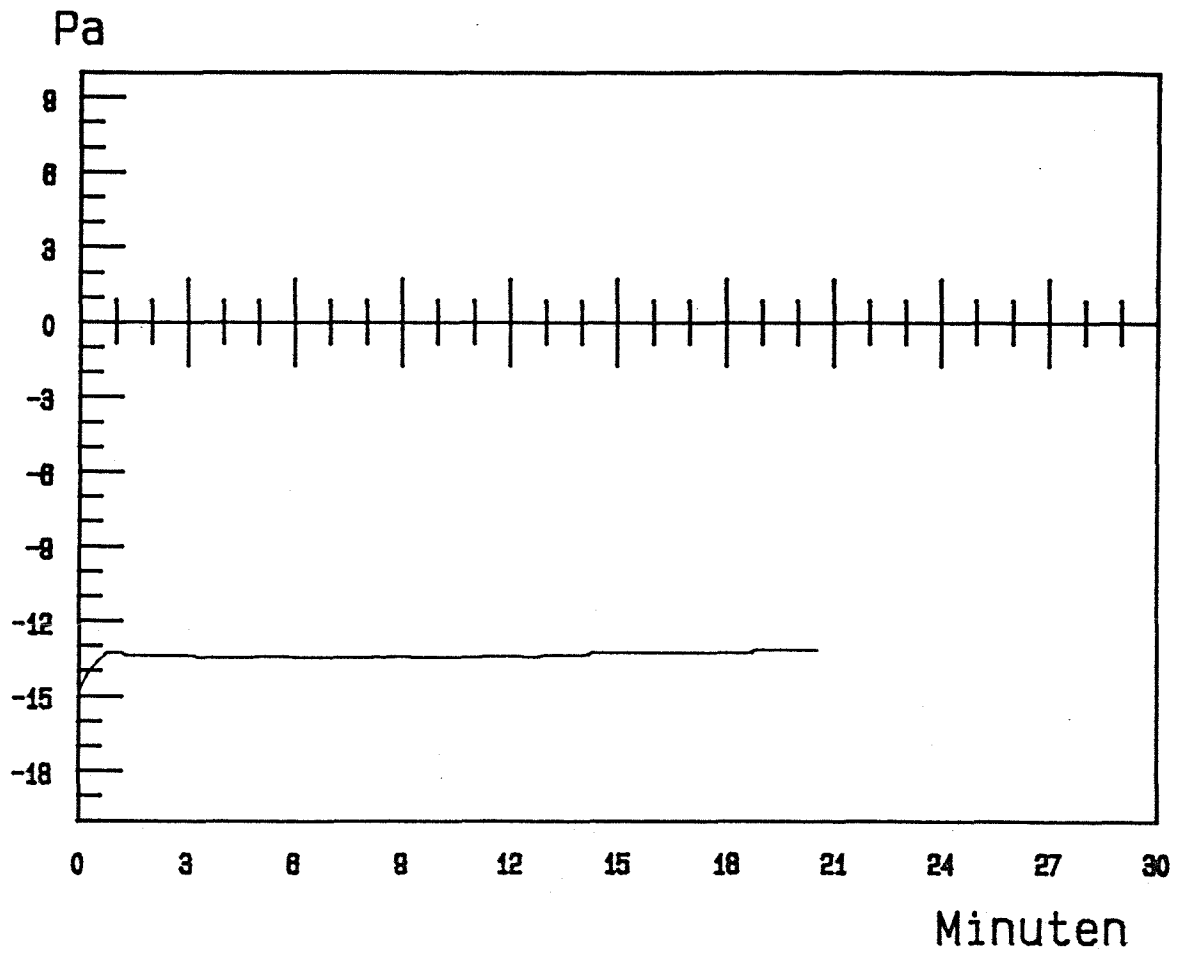
Temperaturen der Meßstellen 1 bis 27 bei Versuch 41.4

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 34.5 | 23.1 | 20.1 |
| 1.00 | 141.2 | 123.2 | 107.9 |
| 2.00 | 119.5 | 108.6 | 97.0 |
| 3.00 | 123.2 | 112.1 | 98.2 |
| 4.00 | 129.5 | 115.7 | 104.1 |
| 5.00 | 126.9 | 113.9 | 105.9 |
| 6.00 | 126.5 | 121.0 | 107.9 |
| 7.00 | 131.0 | 123.6 | 105.8 |
| 8.00 | 133.7 | 125.8 | 114.9 |
| 9.00 | 138.5 | 126.0 | 115.5 |
| 10.00 | 142.5 | 131.9 | 117.5 |
| 11.00 | 140.2 | 129.7 | 120.6 |
| 12.00 | 144.6 | 136.5 | 124.3 |
| 13.00 | 149.2 | 138.4 | 126.6 |
| 14.00 | 142.5 | 135.5 | 123.4 |
| 15.00 | 145.9 | 137.3 | 127.3 |
| 16.00 | 144.5 | 139.5 | 124.9 |
| 17.00 | 147.9 | 137.2 | 128.9 |
| 18.00 | 150.3 | 138.7 | 127.0 |
| 19.00 | 144.7 | 138.2 | 127.1 |

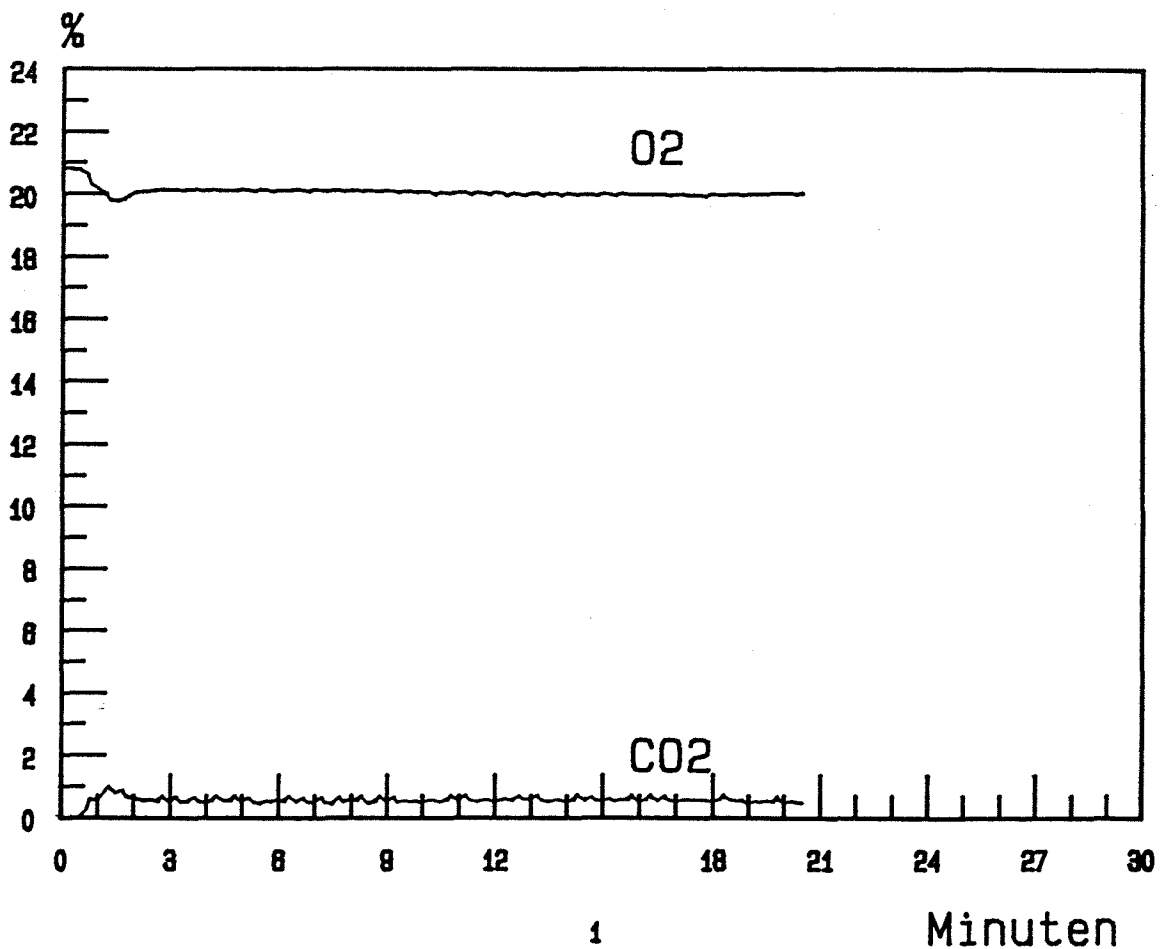
Temperaturen der Meßstellen 28 bis 30 bei Versuch 41.4



Temperatur und Flammenhoehe bei Versuch 41.4



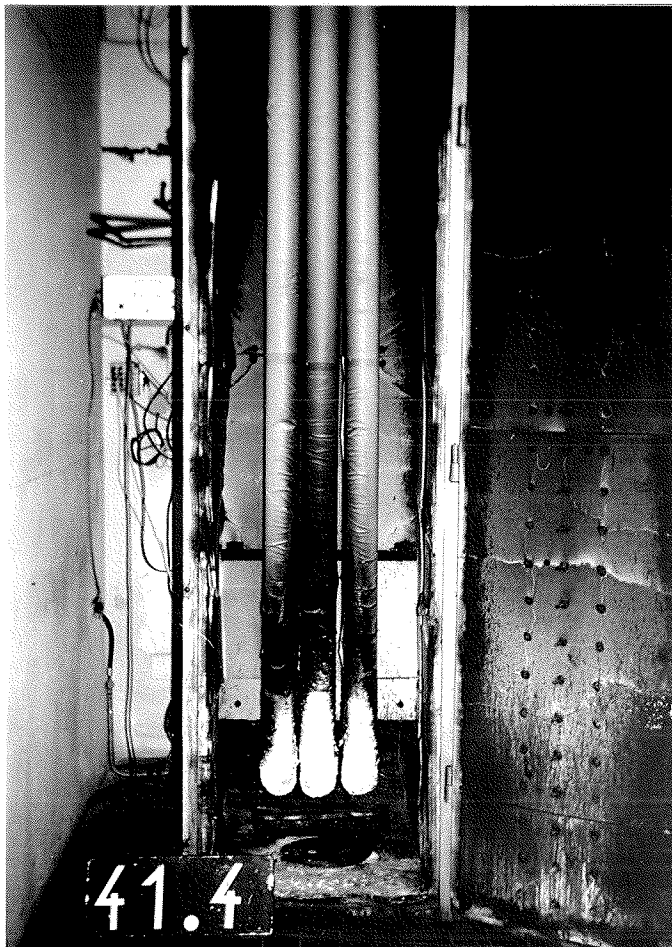
Druckverlauf im Brandraum bei Versuch 41.4



CO₂, CO O₂-Gehalt bei Versuch 41.4



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr.: 42.1 ✕

Materialbeschreibung

Material Nr. 9 : Halbschalen aus PV-Hartschaum

Abmessungen

Innendurchmesser/Außendurchmesser : 62 mm/122 mm
Randdicke : 30 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 42.1 am 02.11.1987

Zeit nach
Versuchsbeginn

Beobachtungen

| | |
|-----|---|
| 0' | Zündung der Holzkrippe (2 kg) durch zwei mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 2' | Material im Knie karbonisiert. |
| 7' | Material schrumpft im Kniebereich zusammen. |
| 20' | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge: Probe 1) 1740 mm
Probe 2) 1740 mm Mittelwert = 1746 mm
Probe 3) 1740 mm

Das eingesetzte Versuchsmaterial ist im Kniebereich und bis zu einer mittleren Restlänge von 1740 mm karbonisiert.

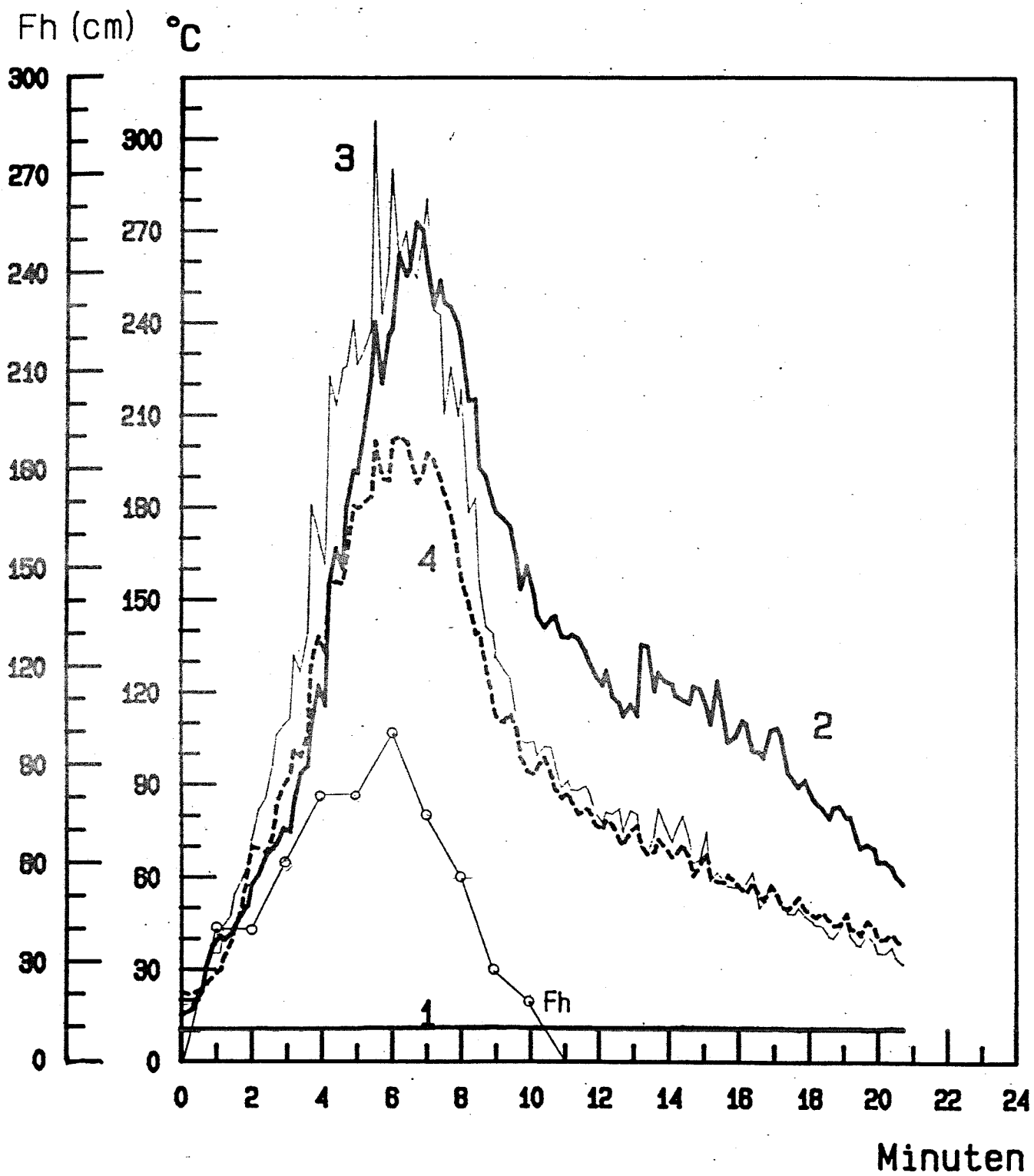
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 10.5 | 20.7 | 17.1 | 18.8 | 15.8 | 15.1 | 15.1 | 17.0 | 17.4 | 17.5 | 17.8 | 18.0 | 18.2 | 18.3 |
| 1.22 | 10.5 | 36.9 | 28.9 | 39.2 | 32.5 | 39.4 | 55.6 | 58.4 | 59.2 | 54.7 | 49.5 | 44.2 | 45.2 | 46.4 |
| 2.22 | 10.6 | 71.7 | 58.4 | 80.1 | 53.6 | 60.7 | 71.2 | 83.7 | 114.0 | 105.5 | 89.1 | 79.0 | 82.4 | 84.9 |
| 3.22 | 10.6 | 103.7 | 89.3 | 102.0 | 72.8 | 84.0 | 117.1 | 134.8 | 150.5 | 148.2 | 136.2 | 128.3 | 131.0 | 132.8 |
| 4.22 | 10.8 | 149.9 | 139.1 | 141.3 | 100.1 | 154.9 | 256.3 | 268.7 | 292.4 | 322.2 | 303.8 | 258.4 | 253.1 | 240.7 |
| 5.22 | 10.9 | 193.9 | 221.6 | 200.3 | 147.6 | 206.6 | 294.8 | 323.9 | 348.9 | 348.2 | 298.5 | 264.5 | 254.1 | 250.1 |
| 6.22 | 11.0 | 215.5 | 309.6 | 213.0 | 183.2 | 261.9 | 337.7 | 370.3 | 384.4 | 382.2 | 334.1 | 293.1 | 283.5 | 280.8 |
| 7.22 | 11.1 | 205.7 | 284.0 | 213.2 | 204.4 | 245.6 | 303.9 | 354.6 | 331.0 | 322.9 | 299.1 | 278.2 | 265.3 | 259.6 |
| 8.22 | 11.2 | 158.9 | 199.4 | 149.9 | 183.9 | 214.7 | 264.9 | 297.0 | 261.2 | 236.8 | 204.6 | 199.6 | 193.0 | 189.4 |
| 9.22 | 11.1 | 120.7 | 139.3 | 106.8 | 155.0 | 176.2 | 184.0 | 202.0 | 166.1 | 147.2 | 138.1 | 142.7 | 136.5 | 133.5 |
| 10.22 | 11.0 | 108.1 | 120.3 | 94.8 | 131.1 | 144.8 | 160.4 | 168.7 | 142.6 | 127.0 | 115.8 | 112.6 | 107.3 | 103.7 |
| 11.22 | 11.0 | 94.6 | 100.0 | 79.9 | 122.9 | 138.5 | 144.6 | 146.4 | 125.5 | 114.1 | 102.8 | 97.4 | 94.6 | 92.5 |
| 12.22 | 11.0 | 85.6 | 97.5 | 77.8 | 113.1 | 126.9 | 132.7 | 130.8 | 105.8 | 95.5 | 89.8 | 86.5 | 85.5 | 84.0 |
| 13.22 | 11.0 | 80.0 | 85.3 | 70.8 | 100.2 | 135.6 | 147.3 | 127.7 | 98.5 | 85.8 | 76.0 | 74.6 | 73.3 | 72.5 |
| 14.22 | 11.0 | 73.4 | 79.2 | 61.9 | 95.4 | 118.9 | 127.9 | 122.9 | 107.9 | 99.5 | 98.7 | 80.8 | 79.9 | 78.6 |
| 15.22 | 10.9 | 69.5 | 74.6 | 59.0 | 83.5 | 109.7 | 119.3 | 109.0 | 80.4 | 71.7 | 62.4 | 62.7 | 61.6 | 61.2 |
| 16.22 | 11.0 | 64.7 | 68.1 | 53.6 | 81.2 | 109.7 | 115.6 | 108.2 | 90.6 | 78.0 | 67.5 | 62.7 | 61.4 | 59.4 |
| 17.22 | 11.0 | 59.4 | 63.1 | 50.4 | 82.5 | 105.6 | 95.1 | 89.6 | 72.4 | 61.5 | 56.2 | 54.2 | 53.7 | 53.0 |
| 18.22 | 10.9 | 54.7 | 59.3 | 49.4 | 65.2 | 84.3 | 75.3 | 72.5 | 58.3 | 50.2 | 46.7 | 47.3 | 46.3 | 45.4 |
| 19.22 | 11.0 | 50.7 | 54.5 | 45.9 | 69.9 | 79.8 | 71.4 | 66.8 | 54.1 | 46.2 | 43.0 | 42.6 | 42.4 | 41.7 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 18.2 | 18.3 | 18.6 | 18.8 | 19.2 | 19.2 | 19.6 | 20.0 | 20.8 | 21.1 | 21.7 | 22.5 | 22.8 |
| 1.22 | 44.2 | 44.7 | 44.0 | 42.5 | 38.6 | 41.7 | 38.1 | 38.7 | 37.6 | 35.1 | 36.3 | 37.1 | 35.4 |
| 2.22 | 81.5 | 83.2 | 80.6 | 76.9 | 71.3 | 76.9 | 71.0 | 72.7 | 72.4 | 66.2 | 69.7 | 72.8 | 66.1 |
| 3.22 | 132.2 | 130.8 | 126.1 | 118.4 | 109.9 | 116.6 | 109.9 | 111.5 | 110.9 | 103.5 | 107.7 | 111.4 | 102.4 |
| 4.22 | 223.0 | 222.7 | 211.5 | 203.5 | 189.9 | 198.6 | 187.0 | 189.9 | 185.5 | 174.2 | 179.9 | 180.7 | 164.1 |
| 5.22 | 231.6 | 227.0 | 220.3 | 212.3 | 203.0 | 207.2 | 198.7 | 195.9 | 196.0 | 185.5 | 190.6 | 194.6 | 182.0 |
| 6.22 | 261.5 | 253.5 | 246.3 | 238.7 | 229.9 | 230.4 | 223.5 | 220.3 | 219.6 | 210.5 | 214.9 | 219.8 | 208.6 |
| 7.22 | 244.1 | 238.5 | 231.4 | 223.9 | 216.5 | 217.1 | 212.2 | 209.1 | 209.9 | 205.6 | 205.9 | 206.9 | 197.1 |
| 8.22 | 176.2 | 172.2 | 169.1 | 166.7 | 164.7 | 158.8 | 160.3 | 156.0 | 157.6 | 159.1 | 154.7 | 155.8 | 152.7 |
| 9.22 | 127.4 | 121.5 | 122.1 | 121.2 | 121.4 | 116.5 | 118.2 | 114.5 | 115.2 | 118.9 | 112.5 | 112.9 | 114.6 |
| 10.22 | 99.4 | 93.0 | 93.2 | 93.0 | 96.0 | 91.0 | 94.1 | 91.5 | 93.4 | 96.7 | 93.3 | 93.8 | 95.8 |
| 11.22 | 88.3 | 83.9 | 85.4 | 84.9 | 85.5 | 82.3 | 83.6 | 82.2 | 83.5 | 85.8 | 83.1 | 84.1 | 84.9 |
| 12.22 | 81.2 | 79.3 | 79.7 | 78.6 | 78.5 | 77.0 | 77.5 | 76.8 | 77.6 | 78.7 | 78.0 | 78.7 | 79.8 |
| 13.22 | 69.6 | 69.1 | 69.1 | 68.6 | 68.9 | 66.4 | 68.1 | 66.6 | 67.9 | 69.7 | 67.3 | 67.7 | 68.4 |
| 14.22 | 74.5 | 72.6 | 72.2 | 71.9 | 70.9 | 69.9 | 69.2 | 68.4 | 69.0 | 68.7 | 67.8 | 68.6 | 68.6 |
| 15.22 | 58.7 | 58.5 | 59.2 | 58.6 | 59.7 | 56.5 | 58.6 | 57.1 | 58.7 | 60.7 | 58.3 | 58.0 | 58.6 |
| 16.22 | 57.7 | 55.2 | 55.4 | 55.2 | 55.6 | 53.8 | 53.9 | 52.9 | 53.8 | 54.7 | 53.7 | 53.3 | 53.9 |
| 17.22 | 51.5 | 50.3 | 50.9 | 50.8 | 51.7 | 49.5 | 49.9 | 48.9 | 50.0 | 50.7 | 49.2 | 49.2 | 49.7 |
| 18.22 | 44.8 | 43.2 | 44.7 | 44.8 | 46.0 | 43.7 | 44.4 | 43.8 | 44.6 | 45.6 | 44.9 | 45.0 | 46.2 |
| 19.22 | 41.3 | 40.2 | 41.1 | 41.2 | 42.7 | 40.8 | 41.4 | 40.6 | 42.0 | 42.8 | 41.9 | 42.0 | 42.5 |

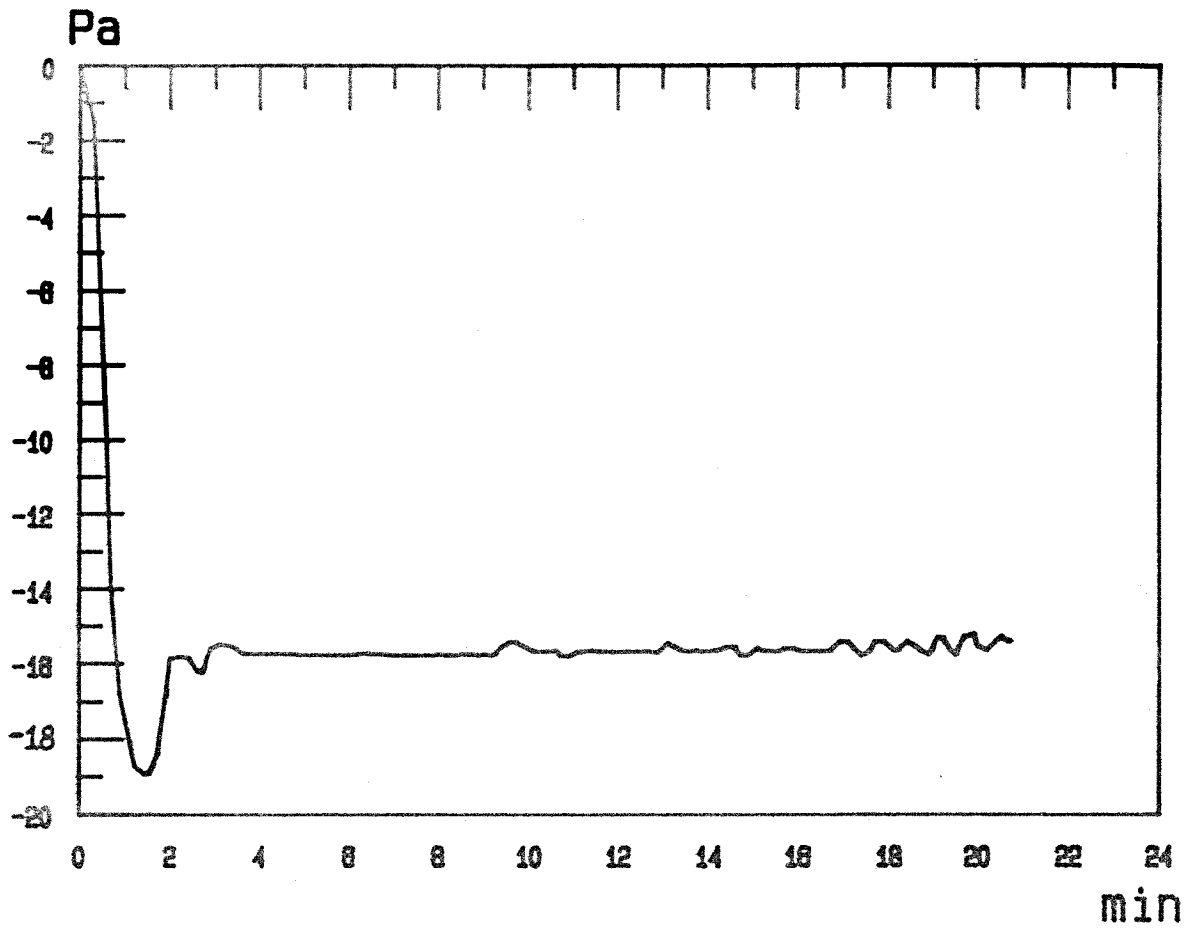
Temperaturen der Meßstellen 1 bis 27 bei Versuch 42.1

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 22.7 | 22.6 | 22.4 |
| 1.22 | 35.9 | 35.4 | 31.1 |
| 2.22 | 69.7 | 70.0 | 67.9 |
| 3.22 | 106.6 | 102.5 | 95.0 |
| 4.22 | 168.1 | 159.9 | 136.5 |
| 5.22 | 186.2 | 184.9 | 173.3 |
| 6.22 | 213.4 | 209.4 | 187.2 |
| 7.22 | 200.4 | 198.9 | 185.9 |
| 8.22 | 152.4 | 154.6 | 139.6 |
| 9.22 | 111.3 | 115.1 | 104.3 |
| 10.22 | 94.1 | 100.6 | 92.1 |
| 11.22 | 84.4 | 88.5 | 79.6 |
| 12.22 | 79.3 | 82.3 | 74.6 |
| 13.22 | 69.2 | 74.0 | 68.7 |
| 14.22 | 68.1 | 70.4 | 63.1 |
| 15.22 | 59.1 | 62.5 | 57.9 |
| 16.22 | 53.9 | 57.7 | 52.5 |
| 17.22 | 49.8 | 53.5 | 48.1 |
| 18.22 | 46.1 | 49.2 | 46.1 |
| 19.22 | 42.4 | 44.5 | 43.8 |

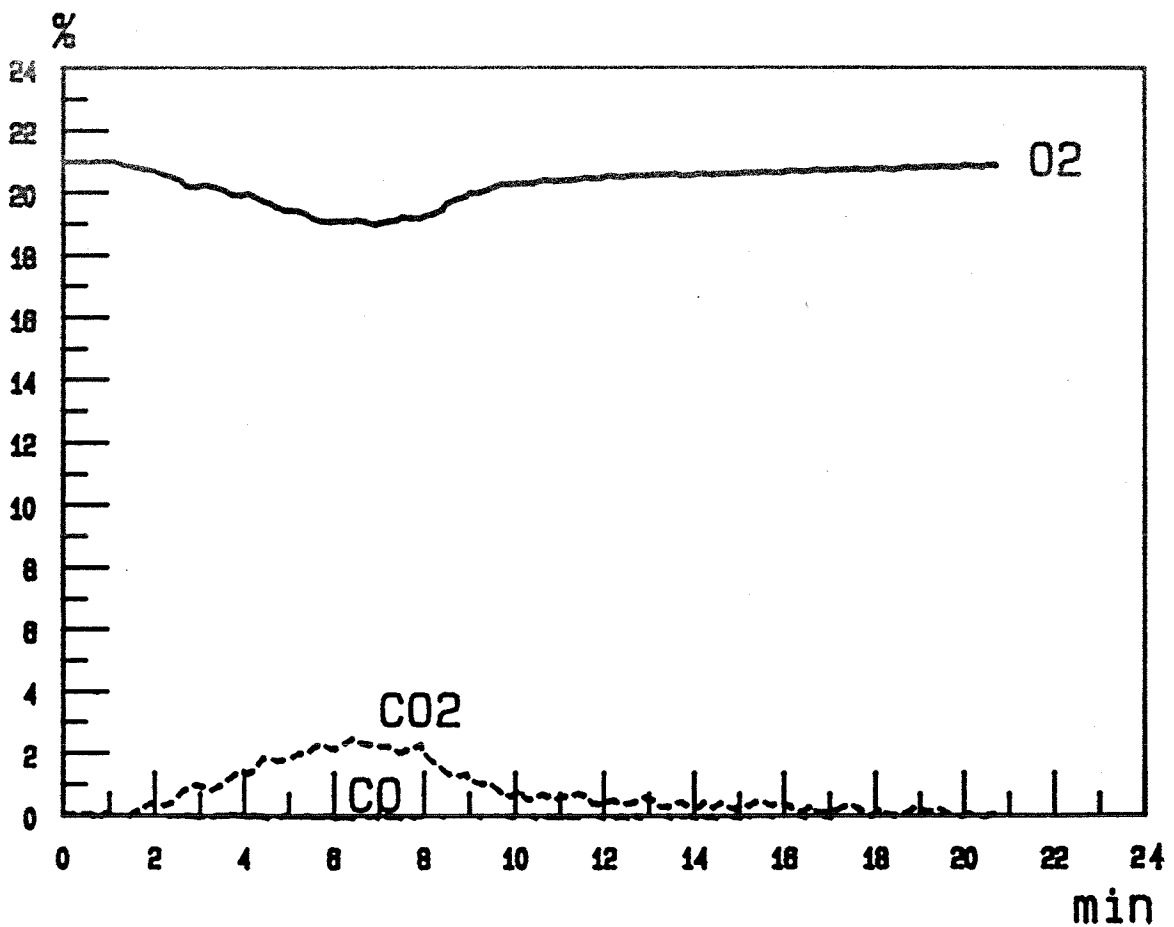
Temperaturen der Meßstellen 28 bis 30 bei Versuch 42.1



Temperatur und Flammenhoehe bei Versuch 42.1



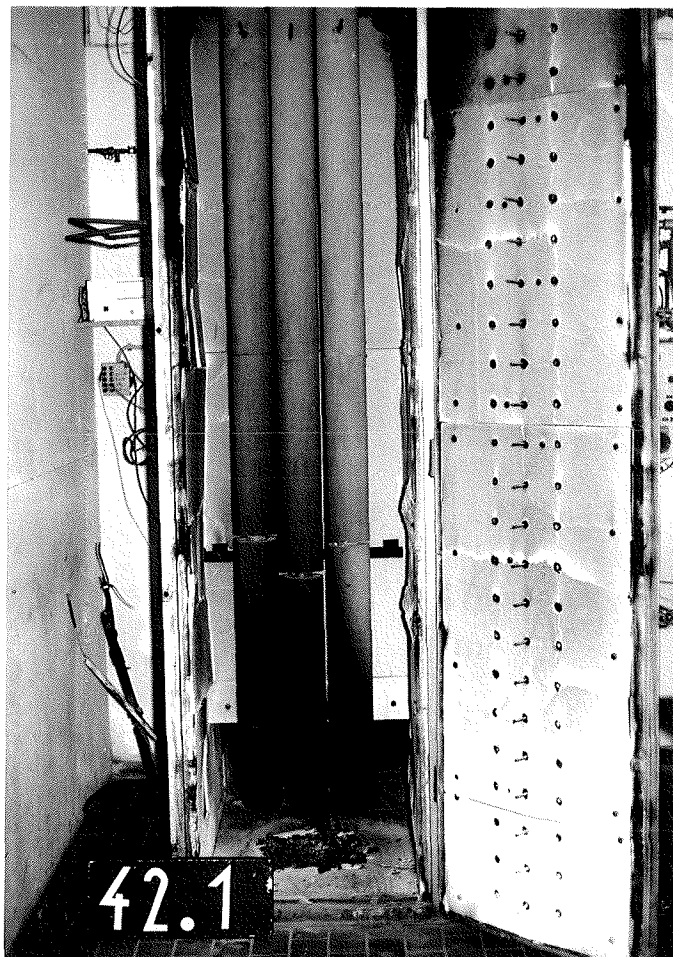
Druckverlauf im Brandraum bei Versuch 42.1



CO₂, CO, O₂-Gehalt bei Versuch 42.1



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 42.2

Materialbeschreibung

Material Nr. 9 : Halbschalen aus PU-Hartschaum

Abmessungen

Innendurchmesser/Außendurchmesser: 62 mm/122 mm
Wanddicke : 30 mm
Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 42.2 am 29.10.1987

Zeit nach
Versuchsbeginn

Beobachtungen

| | | |
|-----|-----|---|
| 0' | | Zündung des Gasbrenners. |
| 0' | 30" | Starke Rauchentwicklung. |
| 2' | 15" | Material verärbt sich schwarz über dem Brenner und an den äußeren Seiten der Knie. |
| 3' | 00" | Material karbonisiert über dem Brenner. |
| 5' | 00" | Material schrumpft über dem Brenner zusammen. |
| 12' | 15" | Material schrumpft weiter zusammen, reißt direkt hinter dem Knie auf in einer Höhe von 10 cm. |
| 20' | | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge: Probe 1) 1750 mm
Probe 2) 1750 mm **Mittelwert = 1750 mm**
Probe 3) 1750 mm

Das Isoliermaterial ist im Bereich des Knies zerstört und bis zu einer mittleren Restlänge 1750 mm karbonisiert.

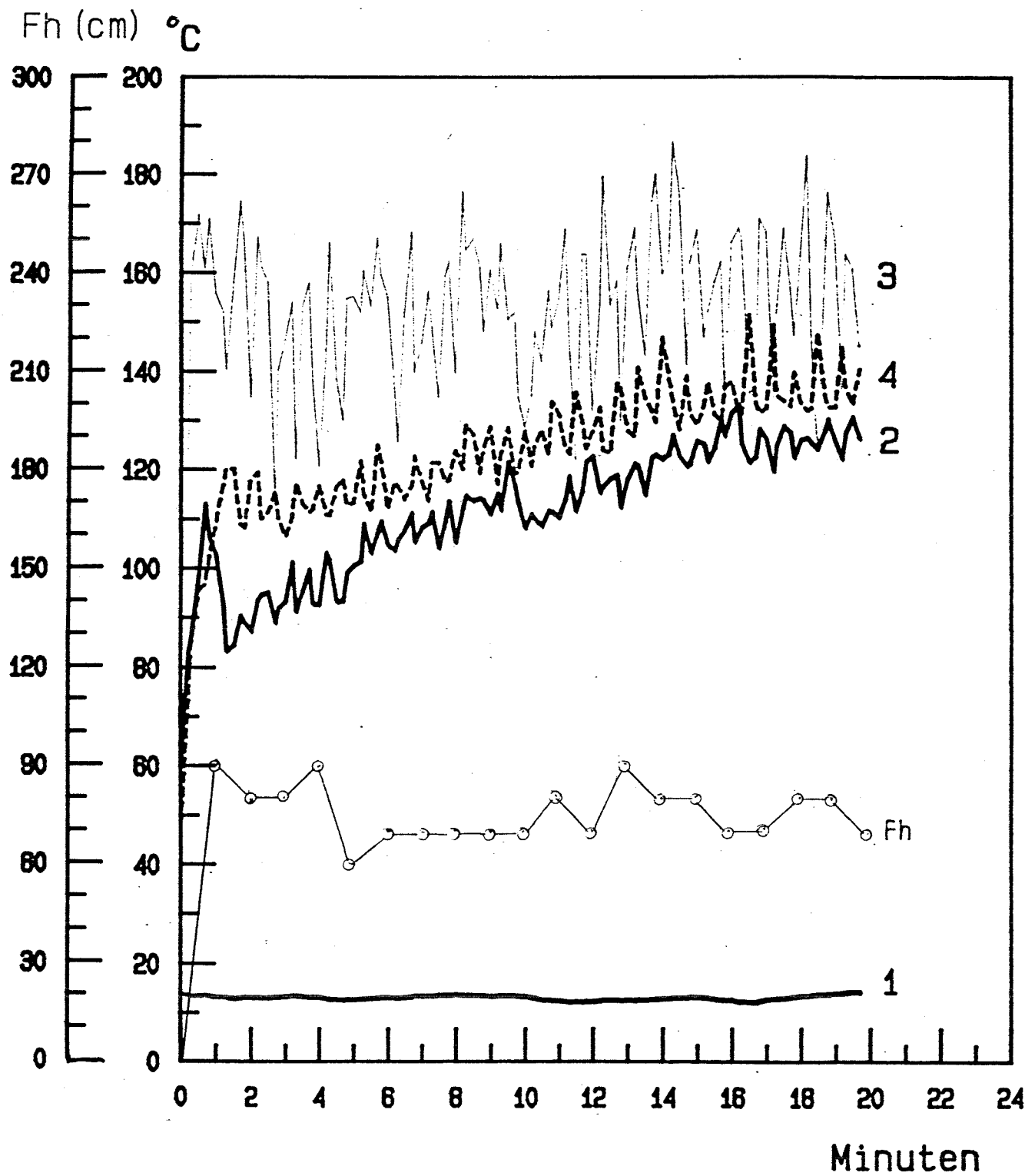
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 13.7 | 40.4 | 20.3 | 24.8 | 45.5 | 60.0 | 95.1 | 105.1 | 164.1 | 187.8 | 149.5 | 110.8 | 115.7 | 107.1 |
| 1.00 | 13.3 | 89.4 | 39.0 | 54.3 | 124.8 | 102.7 | 107.9 | 106.8 | 111.6 | 135.3 | 139.6 | 141.5 | 150.5 | 161.7 |
| 2.00 | 13.2 | 110.4 | 245.4 | 147.7 | 91.6 | 87.4 | 92.3 | 101.1 | 104.2 | 126.5 | 135.9 | 138.5 | 135.9 | 145.8 |
| 3.00 | 13.4 | 102.3 | 107.8 | 97.4 | 98.8 | 93.4 | 96.2 | 103.1 | 112.1 | 132.8 | 146.4 | 151.1 | 147.6 | 149.9 |
| 4.00 | 13.2 | 116.0 | 198.8 | 151.9 | 102.4 | 92.9 | 90.8 | 98.6 | 95.3 | 105.9 | 113.9 | 123.2 | 121.8 | 124.0 |
| 5.00 | 12.8 | 108.1 | 134.4 | 114.5 | 106.8 | 100.7 | 101.7 | 112.8 | 126.6 | 149.5 | 169.3 | 158.4 | 159.8 | 162.3 |
| 6.00 | 13.2 | 109.9 | 140.3 | 106.4 | 109.2 | 104.9 | 107.9 | 115.7 | 130.4 | 155.0 | 169.0 | 161.5 | 160.3 | 162.2 |
| 7.00 | 13.5 | 115.3 | 157.8 | 122.4 | 118.8 | 108.4 | 107.5 | 109.8 | 106.0 | 121.2 | 138.2 | 146.7 | 149.3 | 148.6 |
| 8.00 | 13.8 | 122.4 | 193.5 | 150.9 | 114.8 | 105.5 | 106.6 | 118.0 | 121.4 | 138.9 | 142.4 | 145.4 | 145.3 | 146.8 |
| 9.00 | 13.4 | 127.8 | 197.5 | 145.2 | 115.3 | 111.3 | 116.1 | 124.0 | 146.6 | 167.9 | 172.0 | 169.6 | 171.0 | 168.4 |
| 10.00 | 13.3 | 129.3 | 269.7 | 166.3 | 119.2 | 108.4 | 105.3 | 113.0 | 106.4 | 114.8 | 124.8 | 130.7 | 130.7 | 132.7 |
| 11.00 | 12.5 | 128.7 | 222.9 | 155.3 | 117.8 | 110.6 | 111.9 | 119.2 | 118.7 | 133.1 | 150.5 | 154.6 | 160.5 | 160.8 |
| 12.00 | 12.4 | 134.0 | 388.1 | 153.0 | 127.9 | 123.0 | 116.0 | 120.0 | 110.3 | 113.7 | 122.5 | 132.7 | 134.3 | 139.4 |
| 13.00 | 12.6 | 128.6 | 208.6 | 143.4 | 127.8 | 118.2 | 118.1 | 123.4 | 126.5 | 135.8 | 149.3 | 155.2 | 160.9 | 165.7 |
| 14.00 | 13.0 | 134.7 | 309.4 | 177.3 | 128.2 | 122.4 | 123.6 | 133.6 | 129.4 | 134.2 | 143.5 | 149.4 | 154.9 | 163.5 |
| 15.00 | 13.2 | 128.3 | 196.4 | 136.8 | 131.3 | 126.1 | 125.3 | 130.7 | 124.5 | 138.5 | 153.0 | 161.9 | 167.3 | 167.5 |
| 16.00 | 12.6 | 135.7 | 193.8 | 146.1 | 132.5 | 131.8 | 138.0 | 133.3 | 125.6 | 143.0 | 150.2 | 153.2 | 161.0 | 165.2 |
| 17.00 | 12.8 | 128.8 | 188.1 | 137.2 | 136.2 | 126.4 | 130.3 | 133.4 | 133.3 | 148.5 | 164.8 | 167.9 | 167.2 | 168.8 |
| 18.00 | 13.5 | 134.0 | 215.4 | 144.4 | 134.1 | 126.3 | 129.3 | 135.3 | 132.5 | 141.8 | 150.7 | 156.1 | 160.9 | 165.9 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 94.1 | 87.1 | 84.5 | 75.0 | 67.7 | 71.1 | 62.2 | 64.5 | 61.7 | 55.4 | 62.4 | 61.8 | 57.5 |
| 1.00 | 155.8 | 160.5 | 157.3 | 151.9 | 143.0 | 145.6 | 139.4 | 139.1 | 137.7 | 129.1 | 131.9 | 130.5 | 119.3 |
| 2.00 | 134.7 | 137.3 | 133.5 | 131.3 | 127.7 | 128.9 | 127.4 | 126.3 | 127.3 | 124.2 | 124.5 | 125.7 | 117.1 |
| 3.00 | 146.5 | 147.6 | 143.2 | 139.5 | 133.0 | 132.4 | 129.6 | 127.4 | 126.4 | 121.9 | 120.4 | 119.9 | 112.9 |
| 4.00 | 120.9 | 120.7 | 120.6 | 120.1 | 119.0 | 118.4 | 118.4 | 116.4 | 117.8 | 116.5 | 116.3 | 117.9 | 113.4 |
| 5.00 | 155.3 | 152.9 | 146.3 | 139.9 | 133.2 | 133.1 | 129.1 | 128.1 | 127.1 | 123.6 | 123.4 | 123.9 | 117.4 |
| 6.00 | 155.3 | 152.6 | 148.1 | 142.7 | 135.6 | 134.6 | 130.5 | 128.1 | 126.6 | 123.5 | 121.3 | 120.0 | 115.1 |
| 7.00 | 145.7 | 143.2 | 140.4 | 137.5 | 133.5 | 134.0 | 130.8 | 129.7 | 130.0 | 126.5 | 125.8 | 126.8 | 120.6 |
| 8.00 | 139.8 | 139.7 | 136.4 | 134.8 | 131.3 | 130.8 | 129.2 | 127.5 | 129.1 | 126.8 | 126.6 | 127.9 | 121.7 |
| 9.00 | 160.7 | 153.8 | 153.5 | 147.0 | 143.4 | 141.8 | 136.5 | 134.9 | 135.5 | 132.6 | 132.5 | 134.2 | 128.3 |
| 10.00 | 128.7 | 128.4 | 130.2 | 129.1 | 128.6 | 127.9 | 128.7 | 127.1 | 129.1 | 126.5 | 125.8 | 126.8 | 123.3 |
| 11.00 | 155.0 | 151.7 | 149.5 | 144.4 | 138.6 | 138.7 | 136.3 | 135.7 | 137.1 | 133.3 | 133.5 | 133.8 | 127.2 |
| 12.00 | 132.1 | 136.0 | 134.2 | 132.4 | 128.2 | 128.8 | 129.2 | 126.9 | 129.9 | 128.4 | 126.7 | 127.8 | 125.3 |
| 13.00 | 161.1 | 158.2 | 155.4 | 151.9 | 144.4 | 144.0 | 139.3 | 137.6 | 137.6 | 134.4 | 134.3 | 134.7 | 129.5 |
| 14.00 | 159.9 | 158.9 | 155.0 | 152.8 | 148.2 | 151.8 | 150.6 | 150.2 | 150.3 | 144.8 | 147.3 | 149.6 | 144.0 |
| 15.00 | 169.1 | 167.7 | 162.9 | 158.4 | 149.8 | 150.1 | 145.4 | 143.4 | 142.2 | 138.3 | 137.6 | 137.3 | 131.6 |
| 16.00 | 166.3 | 169.6 | 166.2 | 161.5 | 155.6 | 158.4 | 153.2 | 152.1 | 150.3 | 145.5 | 146.6 | 147.8 | 142.5 |
| 17.00 | 168.4 | 165.6 | 160.7 | 155.2 | 148.3 | 148.6 | 145.7 | 144.5 | 143.5 | 141.3 | 140.7 | 141.4 | 137.4 |
| 18.00 | 164.2 | 162.2 | 157.8 | 153.1 | 146.5 | 146.4 | 142.8 | 142.0 | 142.4 | 140.2 | 140.4 | 139.9 | 134.9 |

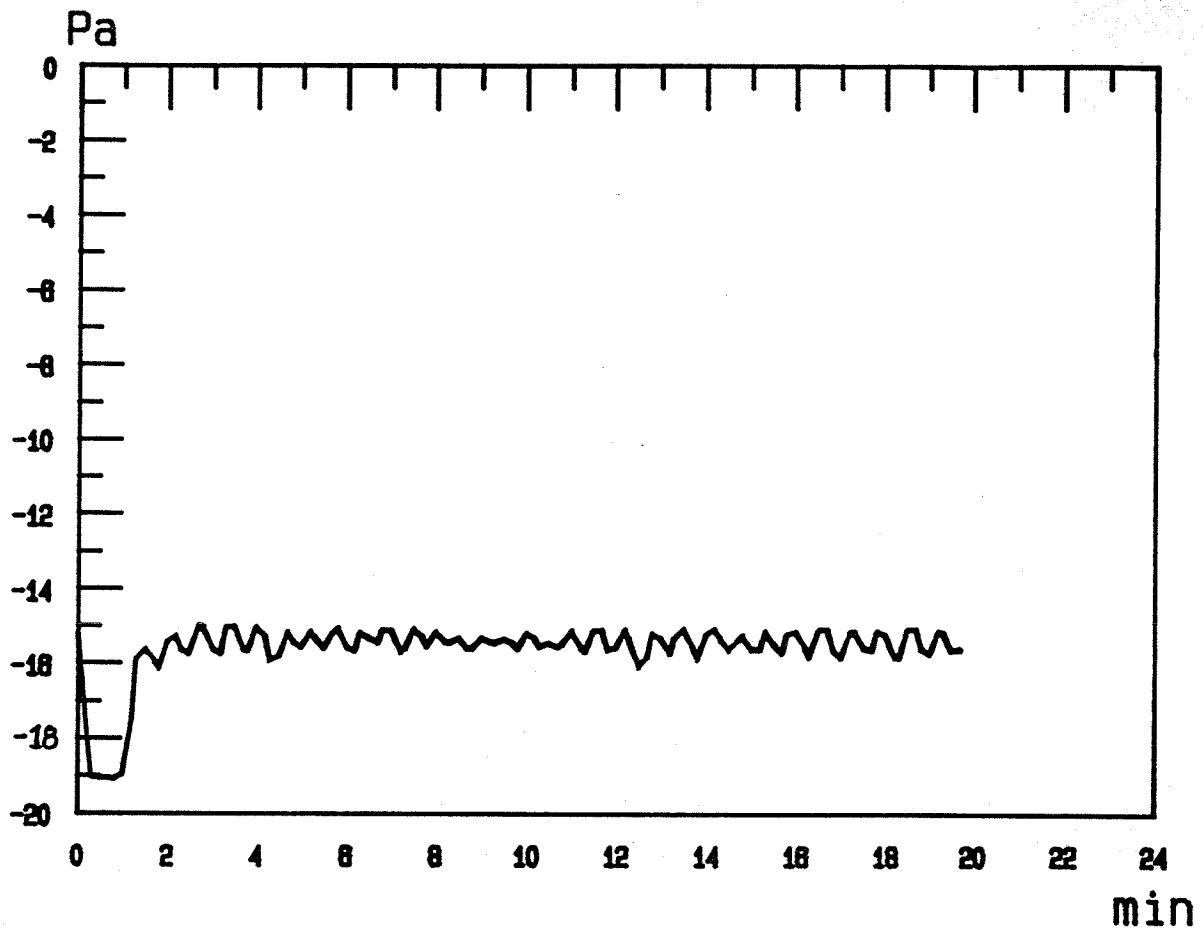
Temperaturen der Meßstellen 1 bis 27 bei Versuch 42.2

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 56.5 | 51.0 | 36.7 |
| 1.00 | 120.8 | 105.7 | 100.9 |
| 2.00 | 121.4 | 112.9 | 120.6 |
| 3.00 | 113.6 | 109.7 | 95.7 |
| 4.00 | 115.7 | 113.8 | 121.4 |
| 5.00 | 119.8 | 115.3 | 105.2 |
| 6.00 | 117.2 | 113.9 | 104.9 |
| 7.00 | 121.8 | 119.2 | 112.8 |
| 8.00 | 124.3 | 123.4 | 124.0 |
| 9.00 | 129.7 | 127.4 | 129.1 |
| 10.00 | 124.3 | 126.2 | 134.5 |
| 11.00 | 130.6 | 130.4 | 133.6 |
| 12.00 | 129.1 | 130.7 | 124.6 |
| 13.00 | 131.1 | 130.8 | 122.9 |
| 14.00 | 144.1 | 143.0 | 154.2 |
| 15.00 | 132.0 | 129.7 | 125.4 |
| 16.00 | 142.4 | 139.9 | 132.2 |
| 17.00 | 138.8 | 134.6 | 124.6 |
| 18.00 | 135.9 | 135.6 | 128.9 |

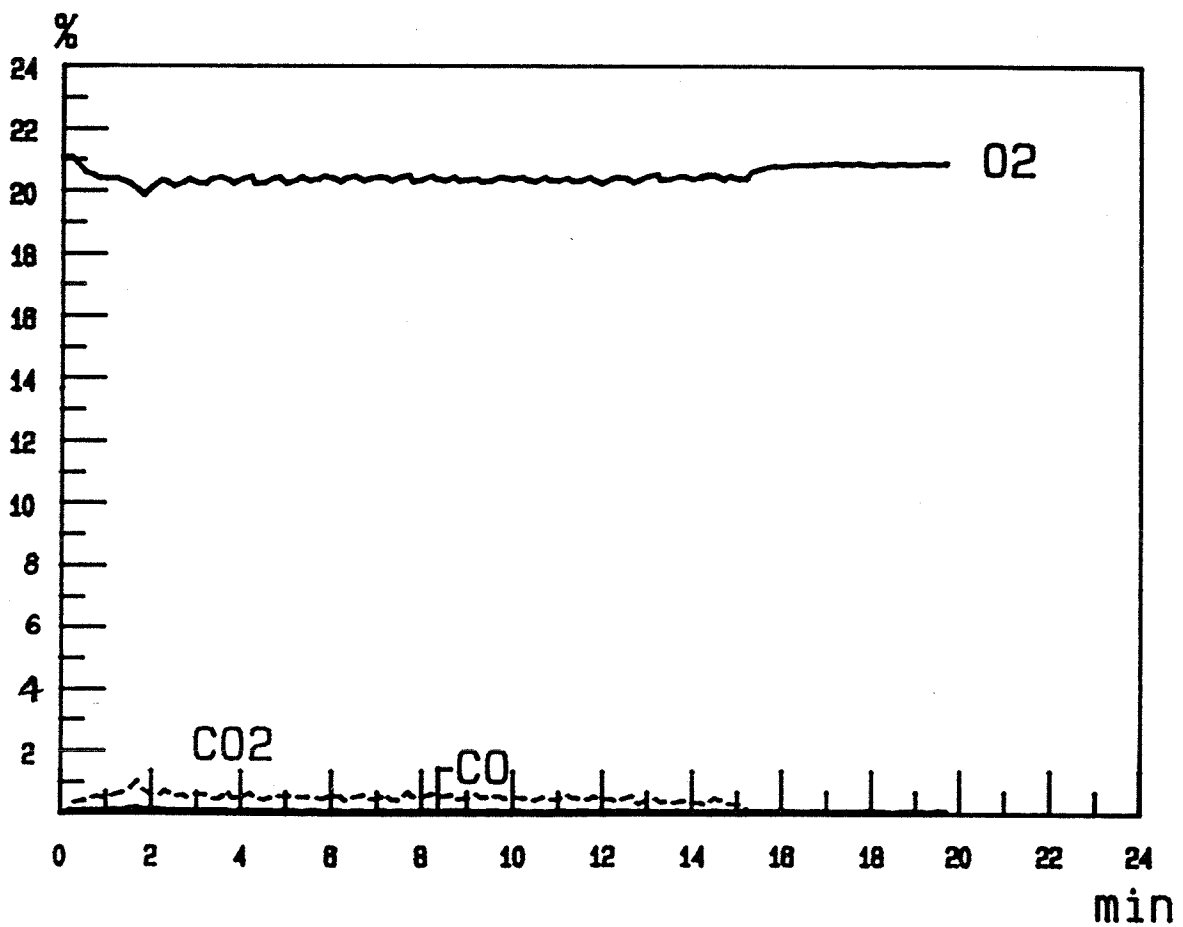
Temperaturen der Meßstellen 28 bis 30 bei Versuch 42.2



Temperatur und Flammenhoehe bei Versuch 42.2



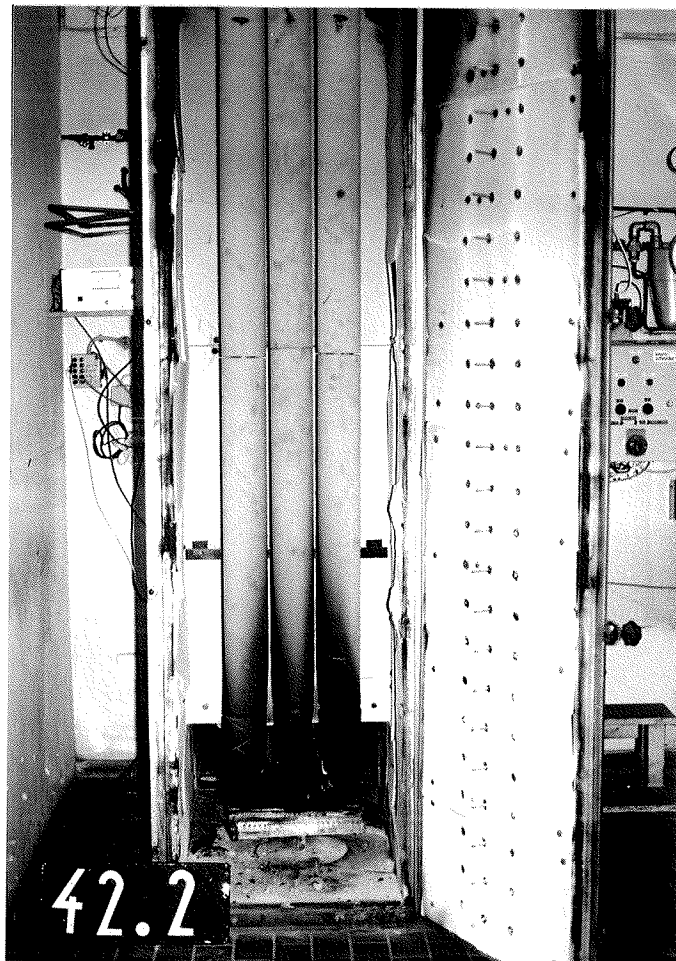
Druckverlauf im Brandraum bei Versuch 42.2



CO₂, CO, O₂-Gehalt bei Versuch 42.2



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 42.3

Materialbeschreibung

Material Nr. 9 : Halbschalen aus PU-Hartschaum

Abmessungen

Innendurchmesser/Außendurchmesser: 62 mm/80 mm

Wanddicke : 9 mm

Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 42.3 am 03.11.1987

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung der Holzkrippe (2 kg) durch zwei mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 4' 30" | Material schrumpft im Bereich der Flammenbeaufschlagung. |
| 8' | Material im Kniebereich karbonisiert. |
| 8' | Flammen zurückgegangen. |
| 11' | Flammen aus. |
| 20' | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge: Probe 1) 2050 mm
Probe 2) 1950 mm **Mittelwert = 2000 mm**
Probe 3) 2000 mm

Das eingesetzte Versuchsmaterial ist im Kniebereich und bis zu einer unzerstörten durchschnittlichen Restlänge von 200 cm karbonisiert.

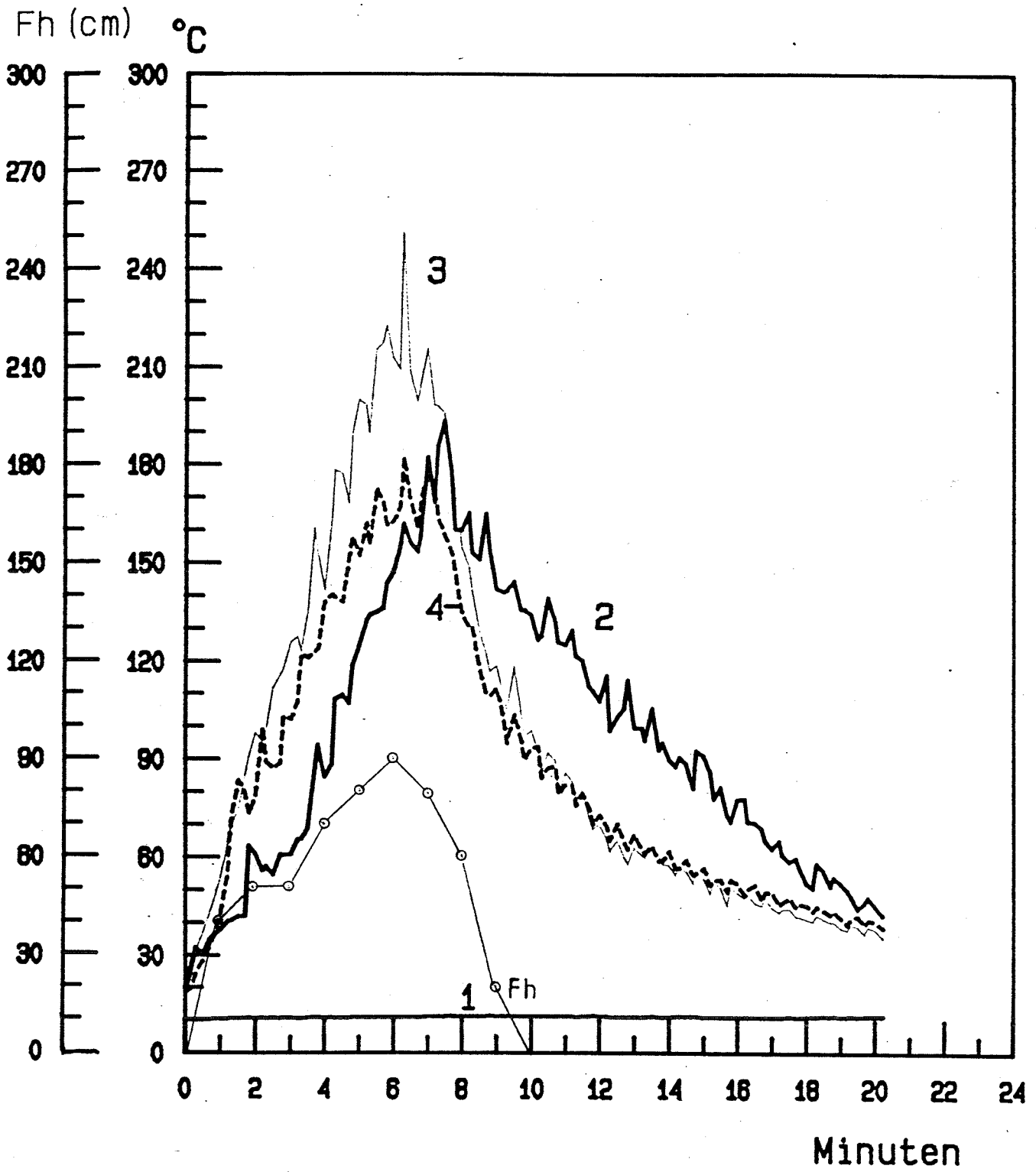
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 10.4 | 19.9 | 15.6 | 19.1 | 17.7 | 19.9 | 25.2 | 23.9 | 24.4 | 20.8 | 18.0 | 18.5 | 19.7 | 20.7 |
| 1.00 | 10.5 | 41.6 | 38.1 | 44.1 | 35.1 | 38.0 | 44.5 | 51.1 | 61.3 | 68.8 | 65.1 | 56.2 | 56.6 | 57.0 |
| 2.00 | 10.8 | 75.0 | 131.4 | 89.1 | 52.9 | 61.2 | 77.7 | 94.6 | 108.6 | 122.6 | 113.6 | 102.2 | 100.4 | 101.6 |
| 3.00 | 10.9 | 102.4 | 161.3 | 132.8 | 56.0 | 60.9 | 72.9 | 81.8 | 98.8 | 115.6 | 130.8 | 128.5 | 127.8 | 124.7 |
| 4.00 | 11.0 | 142.9 | 349.4 | 202.9 | 76.1 | 84.6 | 105.2 | 129.3 | 136.7 | 142.3 | 139.4 | 140.2 | 142.7 | 145.7 |
| 5.00 | 11.2 | 155.7 | 234.2 | 186.6 | 109.0 | 125.1 | 153.7 | 187.6 | 238.3 | 252.6 | 241.9 | 217.1 | 210.6 | 203.9 |
| 6.00 | 11.2 | 174.7 | 276.3 | 208.3 | 133.1 | 147.8 | 192.3 | 218.0 | 245.9 | 247.8 | 242.4 | 231.9 | 221.7 | 215.5 |
| 7.00 | 11.4 | 184.4 | 248.1 | 219.6 | 143.8 | 182.6 | 288.7 | 333.8 | 351.5 | 334.1 | 294.1 | 250.9 | 241.5 | 228.6 |
| 8.00 | 11.4 | 147.9 | 173.1 | 144.2 | 148.7 | 160.0 | 173.2 | 207.7 | 196.5 | 187.0 | 176.2 | 174.2 | 164.3 | 161.0 |
| 9.00 | 11.5 | 122.0 | 138.7 | 121.1 | 138.9 | 142.1 | 150.2 | 172.6 | 146.3 | 140.9 | 131.6 | 130.9 | 126.4 | 123.4 |
| 10.00 | 11.5 | 100.6 | 118.8 | 96.6 | 130.1 | 134.1 | 141.7 | 156.9 | 136.7 | 128.3 | 117.5 | 112.5 | 107.9 | 103.1 |
| 11.00 | 11.5 | 89.0 | 107.1 | 85.8 | 117.7 | 125.1 | 135.7 | 141.8 | 119.3 | 105.0 | 97.3 | 93.3 | 90.9 | 88.3 |
| 12.00 | 11.4 | 80.5 | 99.8 | 76.0 | 102.3 | 108.0 | 114.0 | 119.6 | 92.1 | 79.6 | 74.8 | 75.3 | 74.3 | 73.0 |
| 13.00 | 11.2 | 70.9 | 94.7 | 72.9 | 89.3 | 99.7 | 94.0 | 97.2 | 77.8 | 70.8 | 67.2 | 66.9 | 66.3 | 64.6 |
| 14.00 | 11.2 | 65.5 | 86.6 | 66.9 | 82.8 | 90.1 | 84.3 | 87.4 | 66.2 | 60.6 | 59.2 | 59.8 | 60.2 | 59.6 |
| 15.00 | 11.2 | 60.8 | 85.0 | 59.4 | 78.6 | 91.1 | 85.8 | 83.6 | 68.6 | 62.8 | 57.9 | 56.0 | 55.6 | 55.4 |
| 16.00 | 11.1 | 55.8 | 77.7 | 57.2 | 70.8 | 77.7 | 73.1 | 71.1 | 55.5 | 50.5 | 48.4 | 49.4 | 50.1 | 49.9 |
| 17.00 | 11.1 | 51.8 | 74.8 | 55.9 | 59.0 | 62.6 | 52.1 | 57.3 | 42.3 | 39.3 | 39.6 | 43.1 | 44.6 | 45.0 |
| 18.00 | 11.3 | 47.7 | 68.0 | 49.2 | 53.0 | 52.1 | 43.8 | 49.7 | 38.5 | 36.7 | 37.6 | 40.6 | 41.4 | 41.4 |
| 19.00 | 11.5 | 44.6 | 59.3 | 45.7 | 51.8 | 52.1 | 45.4 | 49.1 | 39.2 | 36.7 | 35.5 | 37.5 | 38.6 | 38.9 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 19.7 | 19.2 | 19.0 | 18.7 | 18.8 | 18.5 | 18.3 | 18.1 | 18.0 | 18.3 | 18.0 | 17.9 | 18.6 |
| 1.00 | 53.6 | 54.0 | 51.5 | 49.0 | 44.6 | 48.1 | 44.7 | 46.5 | 44.8 | 42.2 | 45.3 | 46.5 | 43.2 |
| 2.00 | 98.1 | 100.5 | 94.5 | 90.2 | 83.9 | 89.2 | 84.1 | 85.7 | 83.2 | 77.6 | 81.6 | 83.3 | 77.2 |
| 3.00 | 125.7 | 125.6 | 120.4 | 118.0 | 111.6 | 116.8 | 112.0 | 112.9 | 110.8 | 104.7 | 108.0 | 109.9 | 100.9 |
| 4.00 | 141.8 | 147.2 | 146.7 | 144.5 | 140.5 | 147.0 | 138.2 | 139.6 | 137.7 | 131.5 | 137.9 | 136.8 | 129.6 |
| 5.00 | 200.0 | 194.0 | 183.4 | 176.2 | 165.9 | 169.4 | 163.9 | 164.3 | 163.3 | 156.4 | 159.4 | 160.5 | 151.0 |
| 6.00 | 212.9 | 209.7 | 200.9 | 193.8 | 184.1 | 185.8 | 181.0 | 179.5 | 177.5 | 172.0 | 172.9 | 173.4 | 163.6 |
| 7.00 | 215.8 | 208.0 | 200.6 | 193.6 | 187.9 | 188.6 | 184.2 | 183.2 | 182.6 | 176.5 | 178.6 | 180.4 | 170.2 |
| 8.00 | 154.7 | 151.5 | 149.6 | 145.7 | 143.5 | 139.9 | 141.3 | 137.1 | 140.0 | 141.1 | 137.3 | 138.1 | 134.5 |
| 9.00 | 118.6 | 112.6 | 113.6 | 113.3 | 114.1 | 110.7 | 113.1 | 109.9 | 111.7 | 113.6 | 110.3 | 110.6 | 110.9 |
| 10.00 | 98.7 | 93.5 | 94.9 | 96.0 | 96.5 | 94.0 | 94.6 | 92.4 | 93.5 | 95.4 | 93.7 | 94.6 | 94.9 |
| 11.00 | 85.7 | 81.1 | 82.0 | 82.7 | 83.6 | 81.5 | 82.1 | 80.5 | 81.7 | 82.7 | 80.6 | 81.9 | 83.2 |
| 12.00 | 70.0 | 67.0 | 67.6 | 68.6 | 70.3 | 67.9 | 70.6 | 69.2 | 71.0 | 72.6 | 71.0 | 71.8 | 72.4 |
| 13.00 | 63.0 | 60.9 | 62.4 | 62.9 | 64.1 | 63.7 | 64.5 | 63.9 | 65.4 | 66.2 | 65.4 | 65.9 | 66.3 |
| 14.00 | 57.6 | 55.6 | 56.1 | 56.6 | 57.0 | 56.1 | 57.6 | 57.4 | 59.0 | 60.1 | 59.9 | 60.2 | 60.7 |
| 15.00 | 53.5 | 53.2 | 53.4 | 53.2 | 53.3 | 52.4 | 52.8 | 52.3 | 53.7 | 54.5 | 54.4 | 55.1 | 55.2 |
| 16.00 | 48.9 | 48.5 | 48.8 | 48.8 | 49.0 | 48.2 | 49.1 | 48.6 | 49.8 | 50.4 | 50.2 | 50.3 | 50.4 |
| 17.00 | 44.6 | 43.8 | 44.1 | 44.3 | 45.0 | 43.5 | 44.6 | 44.0 | 45.4 | 46.5 | 46.0 | 46.4 | 47.1 |
| 18.00 | 40.9 | 40.1 | 41.0 | 41.4 | 42.4 | 41.2 | 41.9 | 41.3 | 42.5 | 43.3 | 42.6 | 42.8 | 43.8 |
| 19.00 | 38.4 | 38.5 | 39.2 | 39.5 | 40.1 | 39.0 | 39.5 | 38.8 | 40.0 | 40.6 | 39.8 | 39.8 | 40.5 |

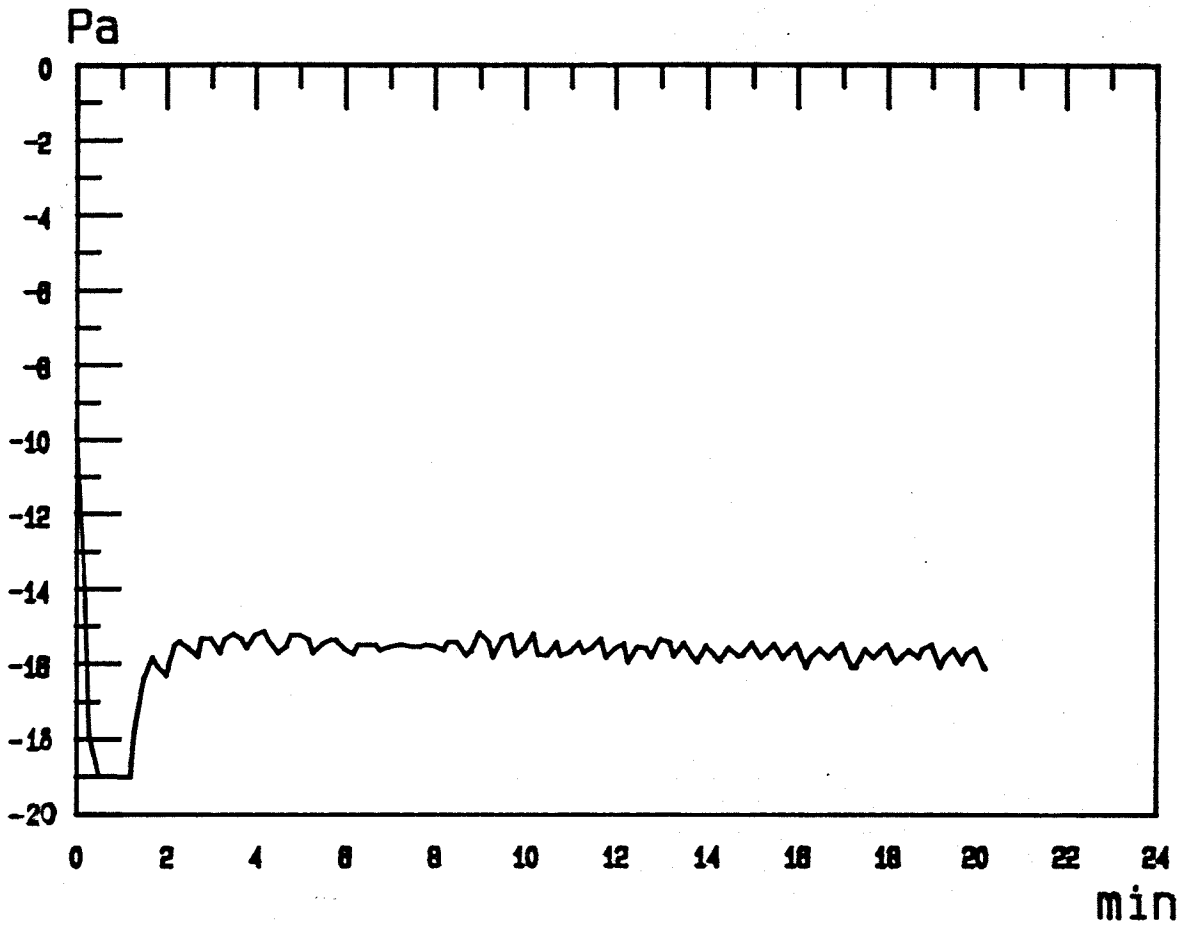
Temperaturen der Meßstellen 1 bis 27 bei Versuch 42.3

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 18.3 | 18.3 | 18.8 |
| 1.00 | 44.8 | 43.2 | 39.7 |
| 2.00 | 80.1 | 78.8 | 75.5 |
| 3.00 | 103.5 | 100.7 | 102.5 |
| 4.00 | 133.3 | 134.2 | 148.1 |
| 5.00 | 154.4 | 150.7 | 152.0 |
| 6.00 | 166.6 | 169.3 | 153.0 |
| 7.00 | 174.6 | 177.2 | 181.0 |
| 8.00 | 134.8 | 139.7 | 129.0 |
| 9.00 | 109.8 | 114.9 | 111.0 |
| 10.00 | 93.6 | 96.9 | 90.5 |
| 11.00 | 81.9 | 84.5 | 80.5 |
| 12.00 | 71.1 | 74.9 | 72.9 |
| 13.00 | 65.8 | 68.0 | 67.3 |
| 14.00 | 60.6 | 62.4 | 62.1 |
| 15.00 | 55.3 | 58.0 | 56.5 |
| 16.00 | 50.5 | 52.7 | 52.4 |
| 17.00 | 47.3 | 49.3 | 51.1 |
| 18.00 | 43.7 | 45.0 | 46.9 |
| 19.00 | 40.3 | 41.8 | 42.3 |

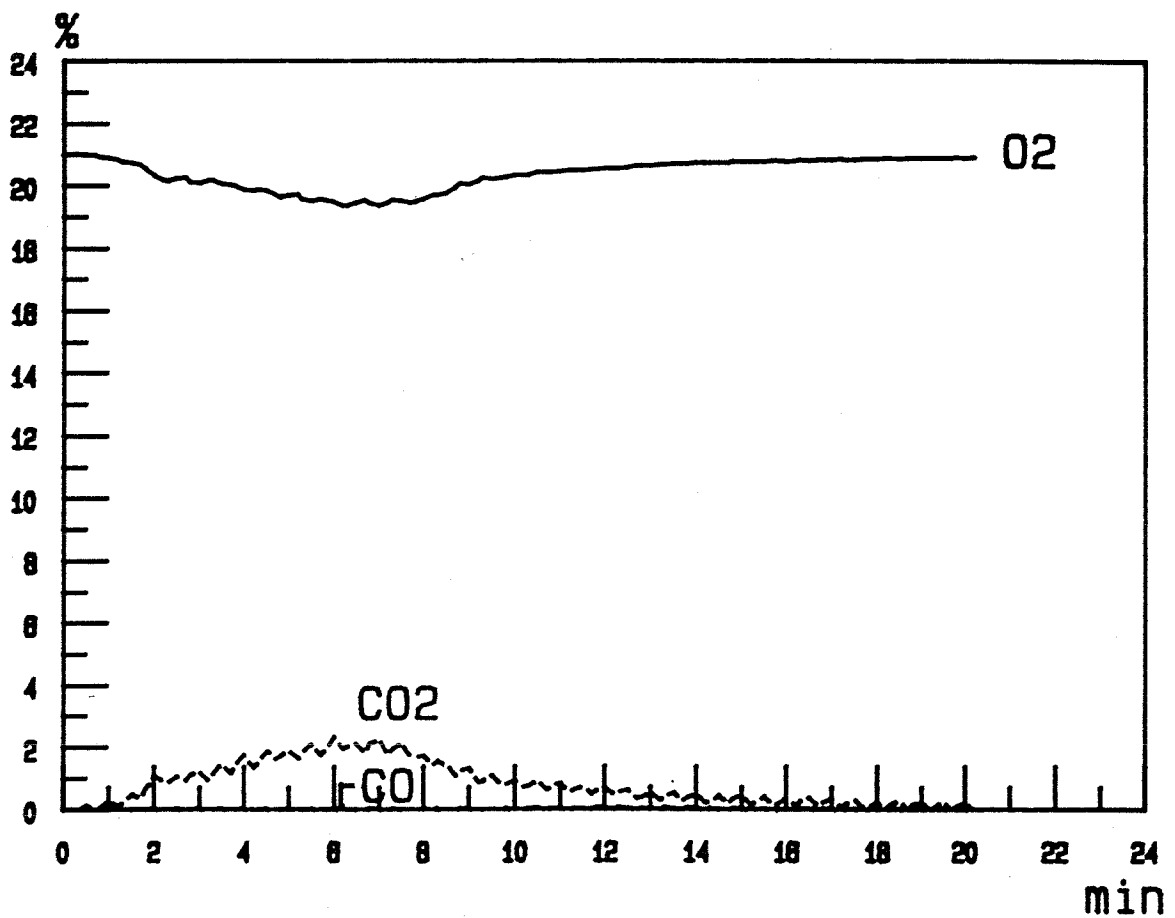
Temperaturen der Meßstellen 28 bis 30 bei Versuch 42.3



Temperatur und Flammenhoehe bei Versuch 42.3



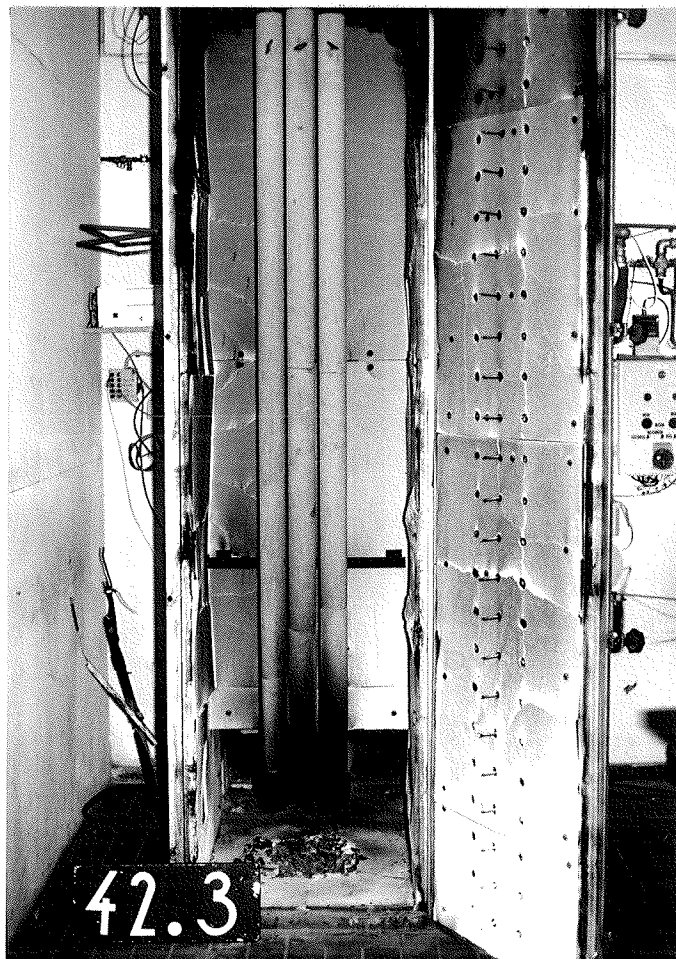
Druckverlauf im Brandraum bei Versuch 42.3



CO, CO2, O2-Gehalt bei Versuch 42.3



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 42.4

Materialbeschreibung

Material Nr. 9 : Halbschalen aus PU-Hartschaum

Abmessungen

Innendurchmesser/Außendurchmesser: 62 mm/80 mm

Wanddicke : 9 mm

Zwischenraum zwischen den Proben : 10 mm

Beobachtungen während des Brandversuches Nr. 42.4 am 27.10.1987

| Zeit nach Versuchsbeginn | | Beobachtungen |
|-----------------------------|-----|---|
| 0' | | Zündung des Gasbrenners. |
| 2' | 15" | Material verfärbt sich schwarz im Bereich der direkten Flammenbeaufschlagung. |
| 8' | 15" | Material schrumpft teilweise. |
| 11' | 30" | Material stark karbonisiert und wölbt sich an den äußeren Seiten der Knie. |
| 20' | | Versuchsende. |

Beobachtungen nach dem Versuch

Unzerstörte Restlänge: Probe 1) 2050 mm
Probe 2) 2050 mm **Mittelwert = 2050 mm**
Probe 3) 2050 mm

Das Isoliermaterial ist im Bereich des Knies und bis zu einer mittleren Restlänge vom 2050 mm karbonisiert.

| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 17.7 | 18.9 | 18.8 | 18.6 | 18.1 | 18.1 | 18.1 | 18.2 | 18.2 | 18.1 | 18.1 | 18.2 | 18.3 | 18.3 |
| 1.00 | 18.5 | 19.2 | 19.0 | 19.0 | 18.5 | 18.5 | 18.5 | 18.6 | 18.6 | 18.6 | 18.6 | 18.5 | 18.7 | 18.7 |
| 2.00 | 18.2 | 19.1 | 19.0 | 18.9 | 18.4 | 18.4 | 18.5 | 18.5 | 18.6 | 18.5 | 18.4 | 18.4 | 18.6 | 18.6 |
| 3.00 | 18.6 | 22.3 | 20.5 | 21.2 | 19.0 | 19.1 | 19.8 | 19.9 | 20.5 | 21.1 | 21.0 | 20.5 | 21.0 | 21.1 |
| 4.00 | 18.6 | 22.5 | 22.6 | 21.6 | 19.7 | 19.7 | 20.0 | 20.1 | 20.7 | 21.5 | 21.6 | 21.2 | 21.8 | 21.8 |
| 5.00 | 18.4 | 80.7 | 57.1 | 72.4 | 58.6 | 67.6 | 72.1 | 81.6 | 105.1 | 141.8 | 145.8 | 138.4 | 144.3 | 147.4 |
| 6.00 | 18.2 | 94.5 | 92.4 | 92.2 | 70.0 | 74.7 | 88.2 | 112.8 | 164.9 | 178.9 | 167.0 | 152.5 | 150.7 | 148.6 |
| 7.00 | 18.4 | 98.6 | 98.5 | 114.0 | 67.8 | 66.7 | 74.9 | 87.8 | 126.1 | 154.3 | 153.0 | 140.8 | 136.0 | 126.5 |
| 8.00 | 18.7 | 104.2 | 174.8 | 126.2 | 71.6 | 68.1 | 72.2 | 88.6 | 105.2 | 121.8 | 120.8 | 119.9 | 115.9 | 114.6 |
| 9.00 | 18.7 | 105.9 | 121.7 | 117.9 | 79.2 | 73.8 | 85.6 | 100.8 | 132.8 | 166.5 | 163.2 | 157.5 | 153.1 | 140.2 |
| 10.00 | 18.7 | 104.9 | 137.1 | 119.7 | 83.2 | 83.4 | 84.9 | 93.2 | 110.1 | 137.1 | 136.8 | 132.6 | 129.4 | 127.4 |
| 11.00 | 18.4 | 110.6 | 106.2 | 107.6 | 83.8 | 91.4 | 110.4 | 134.9 | 178.4 | 206.3 | 191.3 | 172.4 | 170.6 | 165.8 |
| 12.00 | 18.6 | 114.6 | 137.1 | 124.7 | 89.3 | 89.4 | 99.3 | 110.8 | 145.2 | 192.5 | 187.8 | 170.6 | 169.8 | 164.4 |
| 13.00 | 18.4 | 124.0 | 156.2 | 136.6 | 90.3 | 91.1 | 101.5 | 119.8 | 150.0 | 192.2 | 191.8 | 172.7 | 169.7 | 161.8 |
| 14.00 | 18.6 | 125.7 | 232.9 | 156.0 | 92.8 | 91.6 | 90.3 | 98.7 | 96.0 | 110.8 | 126.2 | 136.4 | 132.1 | 134.6 |
| 15.00 | 18.7 | 126.5 | 181.7 | 142.7 | 94.6 | 92.1 | 101.6 | 120.3 | 137.1 | 167.9 | 161.3 | 157.8 | 157.0 | 159.2 |
| 16.00 | 18.7 | 136.2 | 222.9 | 164.4 | 99.2 | 100.6 | 110.9 | 126.9 | 140.4 | 183.4 | 183.6 | 189.0 | 189.4 | 180.0 |
| 17.00 | 18.7 | 137.9 | 193.3 | 154.2 | 101.5 | 102.8 | 111.5 | 125.8 | 135.2 | 176.6 | 170.1 | 171.0 | 167.6 | 166.3 |
| 18.00 | 18.3 | 136.4 | 227.8 | 160.8 | 100.7 | 99.3 | 100.8 | 113.5 | 112.7 | 130.0 | 137.4 | 146.6 | 140.8 | 143.9 |
| 19.00 | 18.2 | 123.3 | 204.7 | 146.9 | 102.9 | 95.8 | 93.0 | 102.9 | 103.7 | 115.6 | 122.4 | 127.8 | 123.7 | 122.3 |
| 20.00 | 18.3 | 121.3 | 161.4 | 143.5 | 91.0 | 93.6 | 96.0 | 107.0 | 113.4 | 123.7 | 129.8 | 134.5 | 131.6 | 126.8 |
| 21.00 | 18.1 | 116.5 | 154.9 | 130.4 | 99.8 | 96.5 | 94.9 | 104.3 | 110.2 | 124.2 | 125.3 | 128.8 | 130.4 | 131.4 |
| 22.00 | 18.0 | 124.8 | 170.9 | 145.6 | 94.6 | 92.4 | 101.8 | 109.5 | 132.6 | 158.5 | 159.4 | 149.5 | 148.7 | 141.8 |
| 23.00 | 18.1 | 126.5 | 171.4 | 144.3 | 100.6 | 102.8 | 122.1 | 150.0 | 203.9 | 206.6 | 181.5 | 167.5 | 166.3 | 158.4 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 18.4 | 18.3 | 18.4 | 18.4 | 18.6 | 18.5 | 18.6 | 18.6 | 18.6 | 18.8 | 18.7 | 18.7 | 18.8 |
| 1.00 | 18.7 | 18.7 | 18.7 | 18.8 | 18.9 | 18.8 | 18.8 | 18.9 | 18.9 | 19.0 | 19.0 | 19.0 | 19.1 |
| 2.00 | 18.6 | 18.6 | 18.6 | 18.7 | 18.8 | 18.7 | 18.8 | 18.8 | 18.8 | 18.9 | 18.9 | 18.9 | 19.1 |
| 3.00 | 21.3 | 21.6 | 21.5 | 21.4 | 21.3 | 21.5 | 21.2 | 21.4 | 21.6 | 21.4 | 21.8 | 21.9 | 22.0 |
| 4.00 | 21.7 | 21.8 | 21.8 | 21.8 | 22.0 | 22.3 | 22.0 | 22.0 | 22.2 | 21.9 | 22.2 | 22.4 | 22.5 |
| 5.00 | 140.2 | 139.4 | 129.8 | 121.0 | 113.5 | 115.9 | 108.8 | 109.2 | 107.3 | 99.6 | 104.6 | 104.5 | 95.3 |
| 6.00 | 136.0 | 130.7 | 123.6 | 117.5 | 112.5 | 111.9 | 107.6 | 106.4 | 104.9 | 99.4 | 100.1 | 100.3 | 93.1 |
| 7.00 | 121.1 | 115.5 | 111.7 | 107.9 | 106.5 | 106.4 | 103.1 | 101.8 | 102.0 | 98.8 | 100.1 | 100.0 | 94.8 |
| 8.00 | 112.3 | 112.9 | 111.3 | 109.3 | 107.2 | 106.6 | 103.7 | 102.1 | 100.8 | 98.3 | 99.0 | 99.7 | 94.8 |
| 9.00 | 134.0 | 129.1 | 124.8 | 120.4 | 116.9 | 116.0 | 111.9 | 110.6 | 109.4 | 104.9 | 105.9 | 106.2 | 100.4 |
| 10.00 | 121.0 | 119.0 | 115.2 | 112.4 | 109.7 | 109.9 | 108.5 | 108.2 | 108.9 | 106.6 | 107.9 | 107.4 | 102.6 |
| 11.00 | 152.7 | 148.0 | 138.8 | 130.8 | 126.4 | 125.1 | 123.4 | 123.4 | 123.9 | 119.7 | 119.9 | 119.3 | 112.5 |
| 12.00 | 156.6 | 151.7 | 143.6 | 137.8 | 133.4 | 134.0 | 129.2 | 127.8 | 127.6 | 123.1 | 124.3 | 123.4 | 117.5 |
| 13.00 | 156.5 | 154.3 | 147.3 | 143.0 | 137.2 | 135.8 | 131.9 | 129.3 | 129.1 | 124.8 | 125.0 | 125.1 | 118.5 |
| 14.00 | 132.0 | 133.4 | 130.7 | 127.7 | 125.1 | 125.7 | 126.1 | 125.4 | 126.5 | 124.4 | 124.8 | 125.9 | 121.8 |
| 15.00 | 154.9 | 152.6 | 148.4 | 143.0 | 139.6 | 138.2 | 135.3 | 133.0 | 133.2 | 128.6 | 129.3 | 128.8 | 122.3 |
| 16.00 | 166.3 | 160.7 | 157.0 | 152.6 | 147.7 | 146.7 | 144.4 | 142.3 | 142.0 | 136.6 | 138.7 | 138.4 | 131.6 |
| 17.00 | 157.8 | 155.1 | 154.2 | 151.1 | 146.6 | 148.4 | 146.8 | 145.5 | 145.5 | 141.5 | 142.8 | 143.6 | 136.7 |
| 18.00 | 137.6 | 136.3 | 132.5 | 131.0 | 129.5 | 128.7 | 130.7 | 128.9 | 130.7 | 130.3 | 128.2 | 127.9 | 124.4 |
| 19.00 | 121.0 | 118.3 | 116.3 | 115.9 | 114.8 | 113.2 | 114.5 | 111.7 | 113.0 | 113.1 | 112.3 | 112.5 | 110.5 |
| 20.00 | 122.3 | 119.3 | 118.1 | 117.2 | 114.8 | 113.7 | 114.0 | 113.1 | 115.1 | 113.5 | 112.6 | 113.2 | 110.2 |
| 21.00 | 128.9 | 127.6 | 124.5 | 121.6 | 118.9 | 118.5 | 116.9 | 114.6 | 115.1 | 113.2 | 113.1 | 112.9 | 109.3 |
| 22.00 | 135.0 | 133.7 | 132.8 | 129.9 | 126.4 | 125.8 | 122.3 | 121.1 | 120.9 | 118.0 | 119.5 | 121.1 | 115.7 |
| 23.00 | 145.8 | 142.8 | 136.3 | 132.2 | 130.5 | 131.1 | 128.7 | 128.4 | 129.3 | 125.1 | 127.3 | 128.0 | 122.0 |

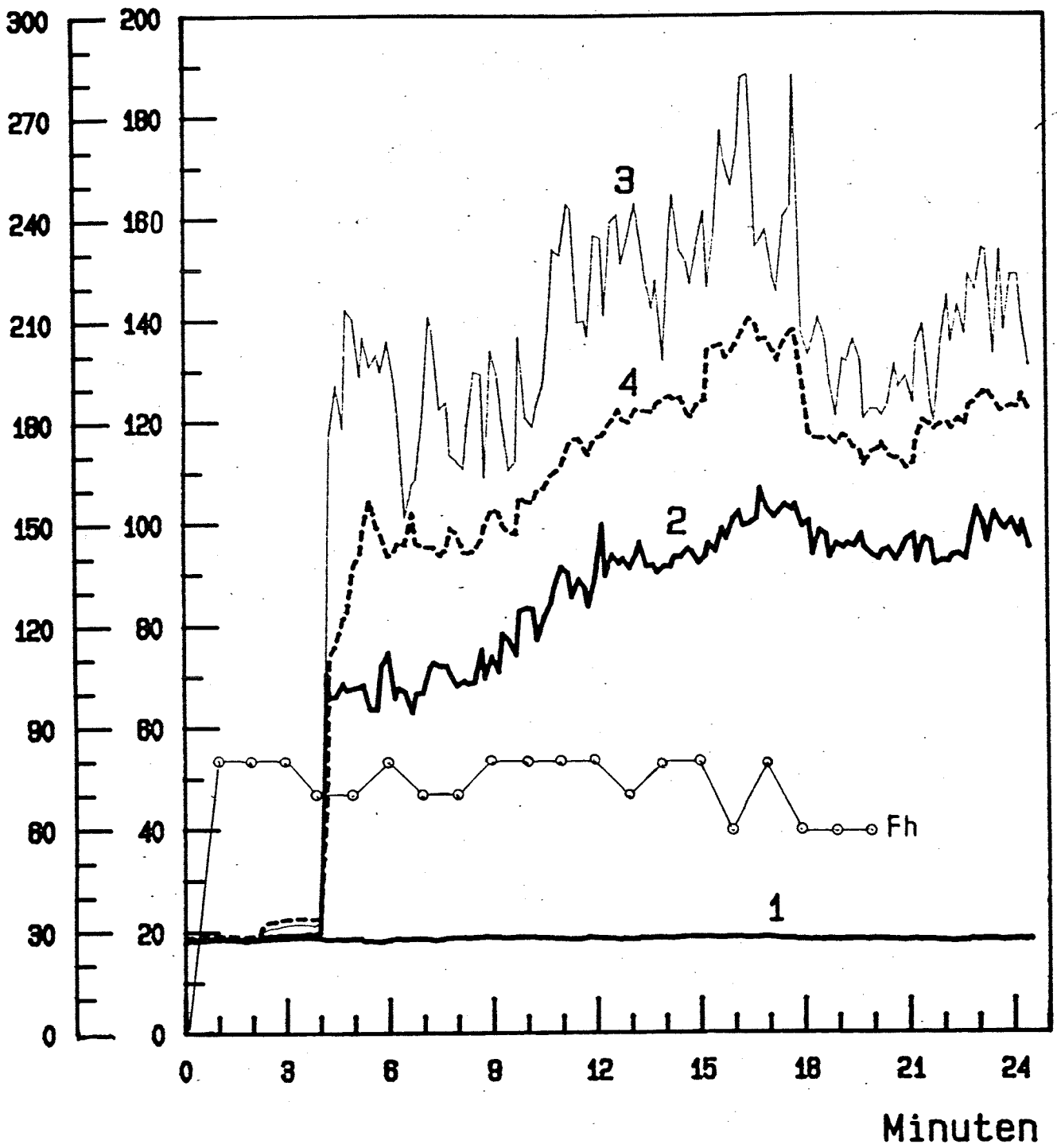
Temperaturen der Meßstellen 1 bis 27 bei Versuch 42.4

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|----|----|----|
|-------------------|----|----|----|

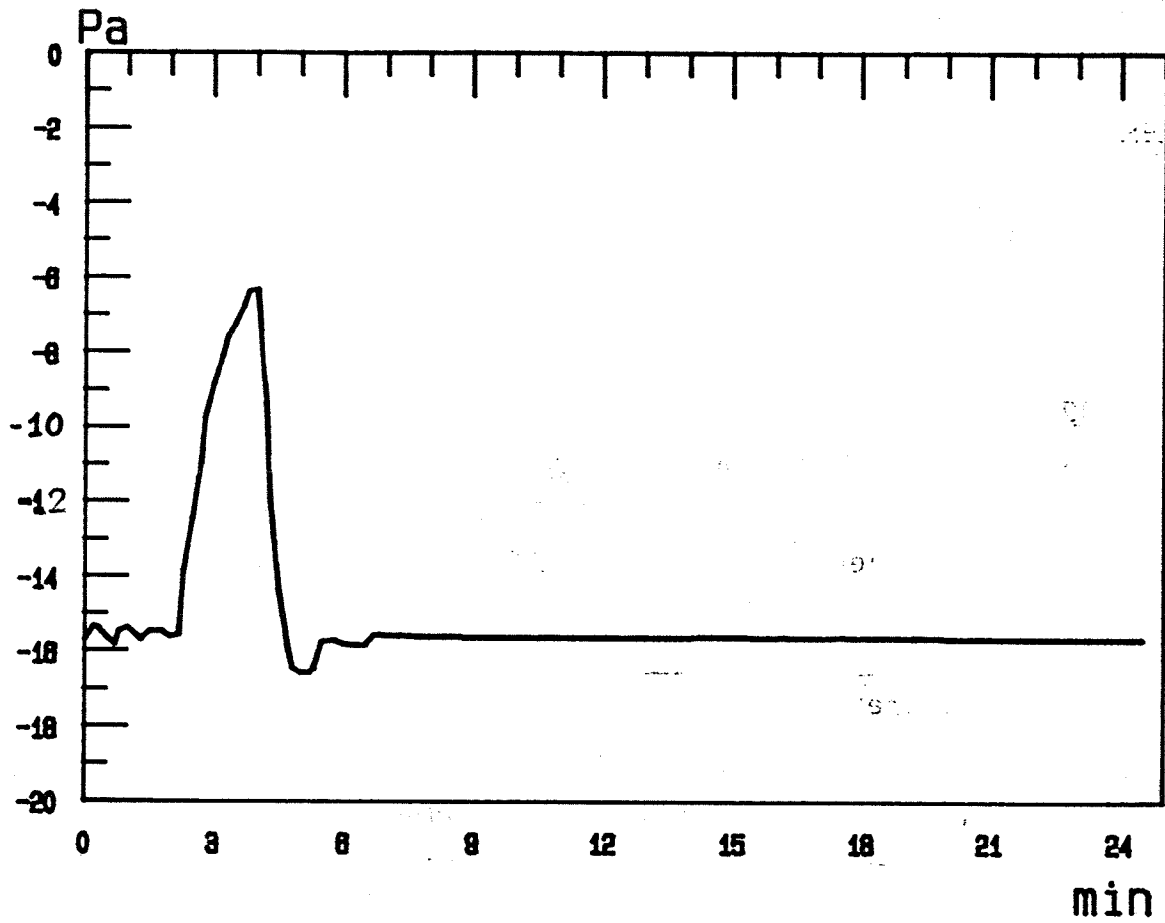
| | | | |
|-------|-------|-------|-------|
| 0.00 | 18.8 | 19.0 | 19.1 |
| 1.00 | 19.1 | 19.3 | 19.5 |
| 2.00 | 19.0 | 19.2 | 19.3 |
| 3.00 | 22.4 | 22.2 | 22.7 |
| 4.00 | 22.6 | 22.5 | 22.7 |
| 5.00 | 98.6 | 92.3 | 83.7 |
| 6.00 | 96.6 | 94.5 | 89.7 |
| 7.00 | 96.2 | 95.7 | 94.3 |
| 8.00 | 95.6 | 96.3 | 102.0 |
| 9.00 | 103.2 | 102.2 | 103.3 |
| 10.00 | 104.9 | 103.9 | 104.0 |
| 11.00 | 115.0 | 114.0 | 104.5 |
| 12.00 | 119.2 | 116.8 | 114.5 |
| 13.00 | 120.2 | 119.5 | 119.5 |
| 14.00 | 124.1 | 124.1 | 124.7 |
| 15.00 | 124.0 | 122.6 | 124.4 |
| 16.00 | 133.6 | 131.3 | 137.3 |
| 17.00 | 138.3 | 136.9 | 133.6 |
| 18.00 | 126.6 | 128.6 | 130.5 |
| 19.00 | 112.1 | 116.2 | 117.8 |
| 20.00 | 110.8 | 113.3 | 117.4 |
| 21.00 | 110.1 | 111.1 | 110.5 |
| 22.00 | 118.0 | 119.4 | 120.8 |
| 23.00 | 123.9 | 122.4 | 125.8 |

Temperaturen der Meßstellen 28 bis 30 bei Versuch 42.4

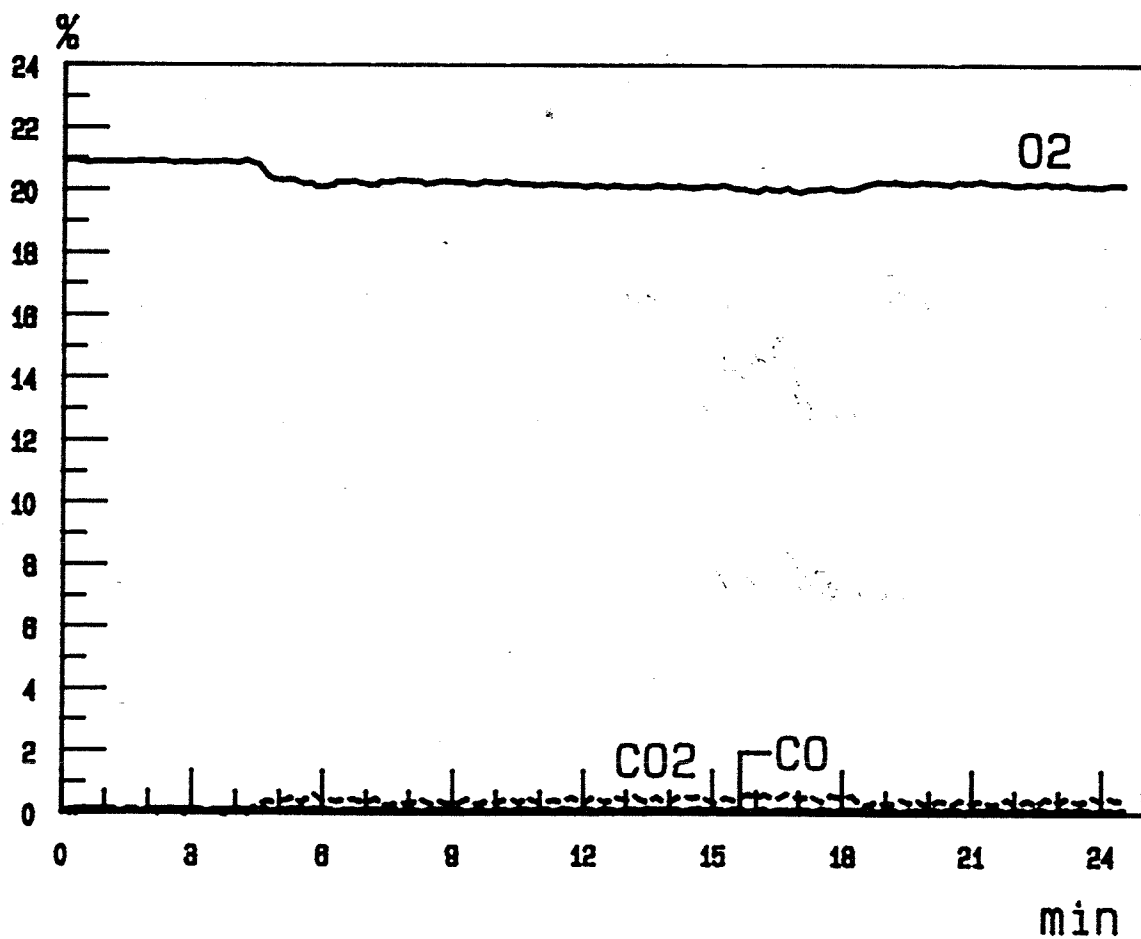
Fh (cm) °C



Temperatur und Flammenhoehe bei Versuch 42.4



Druckverlauf im Brandraum bei Versuch 42.4



CO₂, CO, O₂-Gehalt bei Versuch 42.4



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 45.1

Materialbeschreibung

Material Nr. 10 : 3 Abwasserrohre
aus Polypropylen

Abmessungen

Innendurchmesser/Außendurchmesser: 103,5 mm/109,5 mm
Zwischenraum zwischen den Proben : 16 mm

Beobachtungen während des Brandversuches Nr. 45.1 am 28.08.1987

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|--|
| 0' | Zündung der Holzkrippe durch 3 mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 2' | Das Material verformt sich im Bereich des ho- rizontalen Schenkels. |
| 3' | Im Bereich des Knies des horizontalen Schenkels tropft das Material brennend ab. Das Material fällt teilweise auf die Krippe und brennt dort mit ca. 40 cm hohen Flammen mit. |
| 5' 30" | Zunehmende Flammenhöhe. Der Brandraum ist voll Flammen. |
| 6' | 2 Abwasserrohre Abfallen fallen auf den Brandraumboden und brennen dort weiter. |
| 7'- 20' | Intensives Brandgeschehen. Flüssiges Polypropylen tritt aus den Öffnungen der Versuchseinrichtung aus. |
| 20' | Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0 mm

Das eingesetzte Probenmaterial ist vollständig verbrannt.

| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|
| 0.00 | 16.8 | 19.2 | 22.2 | 21.0 | 19.0 | 19.0 | 19.1 | 19.0 | 19.2 | 19.2 | 19.1 | 19.1 | 19.1 | 19.4 |
| 1.00 | 16.9 | 28.8 | 32.0 | 29.0 | 24.6 | 27.1 | 34.1 | 33.6 | 43.3 | 48.6 | 44.9 | 39.8 | 37.3 | 38.8 |
| 2.00 | 17.1 | 30.8 | 42.9 | 35.0 | 26.6 | 28.8 | 31.5 | 34.1 | 41.4 | 46.0 | 43.1 | 41.3 | 38.9 | 40.7 |
| 3.00 | 16.8 | 44.6 | 51.1 | 46.1 | 30.0 | 34.3 | 42.7 | 44.2 | 59.8 | 68.1 | 61.2 | 57.3 | 53.3 | 55.7 |
| 4.00 | 16.8 | 80.2 | 87.6 | 91.2 | 41.1 | 46.8 | 63.0 | 67.2 | 90.5 | 110.5 | 120.4 | 116.2 | 103.8 | 127.9 |
| 5.00 | 16.8 | 161.6 | 127.9 | 141.6 | 231.7 | 485.1 | 573.6 | 352.1 | 488.8 | 459.3 | 383.3 | 329.1 | 301.6 | 341.0 |
| 6.00 | 16.9 | 569.9 | 438.8 | 720.5 | 736.7 | 788.9 | 843.4 | 802.3 | 885.8 | 920.8 | 913.3 | 904.3 | 881.6 | 911.7 |
| 7.00 | 16.6 | 530.6 | 611.6 | 681.5 | 884.9 | 898.8 | 955.6 | 953.2 | 983.8 | 989.4 | 982.2 | 960.7 | 899.0 | 936.1 |
| 8.00 | 17.2 | 482.7 | 786.6 | 637.8 | 714.9 | 771.7 | 821.2 | 849.5 | 843.6 | 832.7 | 823.1 | 812.3 | 769.0 | 769.4 |
| 9.00 | 17.3 | 457.0 | 721.2 | 611.2 | 639.6 | 718.8 | 796.3 | 789.9 | 812.1 | 799.5 | 777.1 | 748.6 | 701.7 | 717.0 |
| 10.00 | 17.4 | 463.7 | 677.0 | 622.2 | 504.9 | 673.6 | 753.5 | 735.6 | 723.3 | 713.1 | 694.5 | 681.2 | 656.2 | 679.9 |
| 11.00 | 17.5 | 460.2 | 670.4 | 589.0 | 387.0 | 545.5 | 767.2 | 755.1 | 751.2 | 732.7 | 713.5 | 695.8 | 661.3 | 682.5 |
| 12.00 | 17.5 | 477.3 | 767.8 | 617.4 | 394.0 | 561.8 | 840.3 | 796.8 | 858.9 | 836.1 | 799.6 | 771.1 | 731.9 | 761.7 |
| 13.00 | 17.6 | 474.0 | 695.5 | 607.4 | 544.0 | 663.2 | 835.2 | 808.6 | 801.9 | 762.3 | 744.9 | 723.7 | 688.3 | 697.4 |
| 14.00 | 17.8 | 479.1 | 697.1 | 603.4 | 668.2 | 787.3 | 853.8 | 812.8 | 814.3 | 805.6 | 792.3 | 771.8 | 738.3 | 730.3 |
| 15.00 | 18.0 | 543.1 | 804.5 | 751.8 | 692.0 | 802.8 | 874.9 | 867.6 | 909.3 | 900.1 | 889.4 | 859.6 | 821.4 | 846.0 |
| 16.00 | 18.2 | 554.9 | 828.3 | 719.3 | 564.5 | 767.9 | 842.5 | 810.2 | 806.1 | 810.5 | 818.3 | 816.9 | 823.5 | 810.5 |
| 17.00 | 18.3 | 598.2 | 855.4 | 798.2 | 573.2 | 771.0 | 842.7 | 825.8 | 806.2 | 813.5 | 829.7 | 834.6 | 845.6 | 839.6 |
| 18.00 | 18.4 | 624.0 | 826.5 | 798.8 | 571.6 | 762.6 | 783.6 | 799.5 | 787.6 | 789.7 | 817.8 | 827.7 | 841.6 | 838.8 |
| 19.00 | 18.7 | 642.1 | 797.7 | 815.5 | 572.1 | 765.1 | 825.9 | 813.4 | 780.3 | 784.8 | 808.2 | 820.9 | 834.3 | 836.2 |
| 20.00 | 19.0 | 656.6 | 782.6 | 832.3 | 548.5 | 768.6 | 803.9 | 823.1 | 784.5 | 787.7 | 811.5 | 826.2 | 839.8 | 843.0 |
| 21.00 | 19.3 | 650.0 | 796.9 | 839.4 | 560.5 | 792.2 | 851.3 | 820.5 | 800.6 | 808.7 | 837.5 | 855.7 | 861.4 | 862.6 |
| 22.00 | 19.6 | 671.0 | 810.9 | 845.2 | 527.7 | 769.5 | 861.4 | 841.1 | 829.1 | 829.9 | 872.1 | 905.9 | 900.8 | 882.4 |
| 23.00 | 19.7 | 695.3 | 831.6 | 878.4 | 538.9 | 807.4 | 891.0 | 883.8 | 900.4 | 896.0 | 939.6 | 917.2 | 953.5 | 935.0 |
| 24.00 | 19.8 | 643.7 | 811.9 | 826.5 | 624.1 | 778.2 | 902.1 | 825.0 | 823.6 | 824.3 | 843.8 | 853.0 | 855.6 | 852.6 |
| 25.00 | 20.1 | 635.3 | 805.8 | 849.8 | 615.8 | 788.1 | 898.1 | 825.1 | 824.7 | 827.0 | 856.3 | 877.7 | 872.9 | 864.7 |
| 26.00 | 20.3 | 676.2 | 895.6 | 880.9 | 649.3 | 856.7 | 920.1 | 876.0 | 878.6 | 881.3 | 902.4 | 912.5 | 911.7 | 913.4 |
| 27.00 | 20.7 | 669.9 | 852.3 | 865.4 | 657.2 | 834.9 | 878.3 | 905.4 | 962.1 | 931.6 | 932.4 | 933.9 | 923.0 | 920.2 |
| 28.00 | 20.6 | 700.2 | 973.9 | 896.9 | 695.7 | 918.2 | 941.0 | 973.6 | 986.1 | 1010.4 | 942.4 | 942.5 | 940.8 | 943.8 |
| 29.00 | 20.9 | 683.2 | 983.3 | 854.9 | 957.3 | 966.5 | 953.0 | 936.5 | 912.3 | 877.5 | 896.7 | 917.2 | 912.7 | 903.9 |
| 30.00 | 21.4 | 564.1 | 649.0 | 609.3 | 460.4 | 600.3 | 565.4 | 687.4 | 615.3 | 585.7 | 606.4 | 643.7 | 653.3 | 644.4 |
| 31.00 | 20.9 | 517.7 | 589.4 | 612.9 | 484.8 | 545.6 | 569.1 | 590.1 | 565.8 | 566.4 | 568.5 | 581.2 | 600.6 | 599.2 |
| 32.00 | 20.9 | 485.9 | 552.4 | 565.6 | 457.3 | 511.3 | 529.8 | 544.3 | 530.3 | 532.9 | 529.1 | 536.5 | 555.1 | 557.3 |
| 33.00 | 21.0 | 457.5 | 531.2 | 534.6 | 459.0 | 495.0 | 505.9 | 514.8 | 502.9 | 502.3 | 497.1 | 506.4 | 523.2 | 532.9 |

Temperaturen der Meßstellen 1 bis 14 bei Versuch 45.1

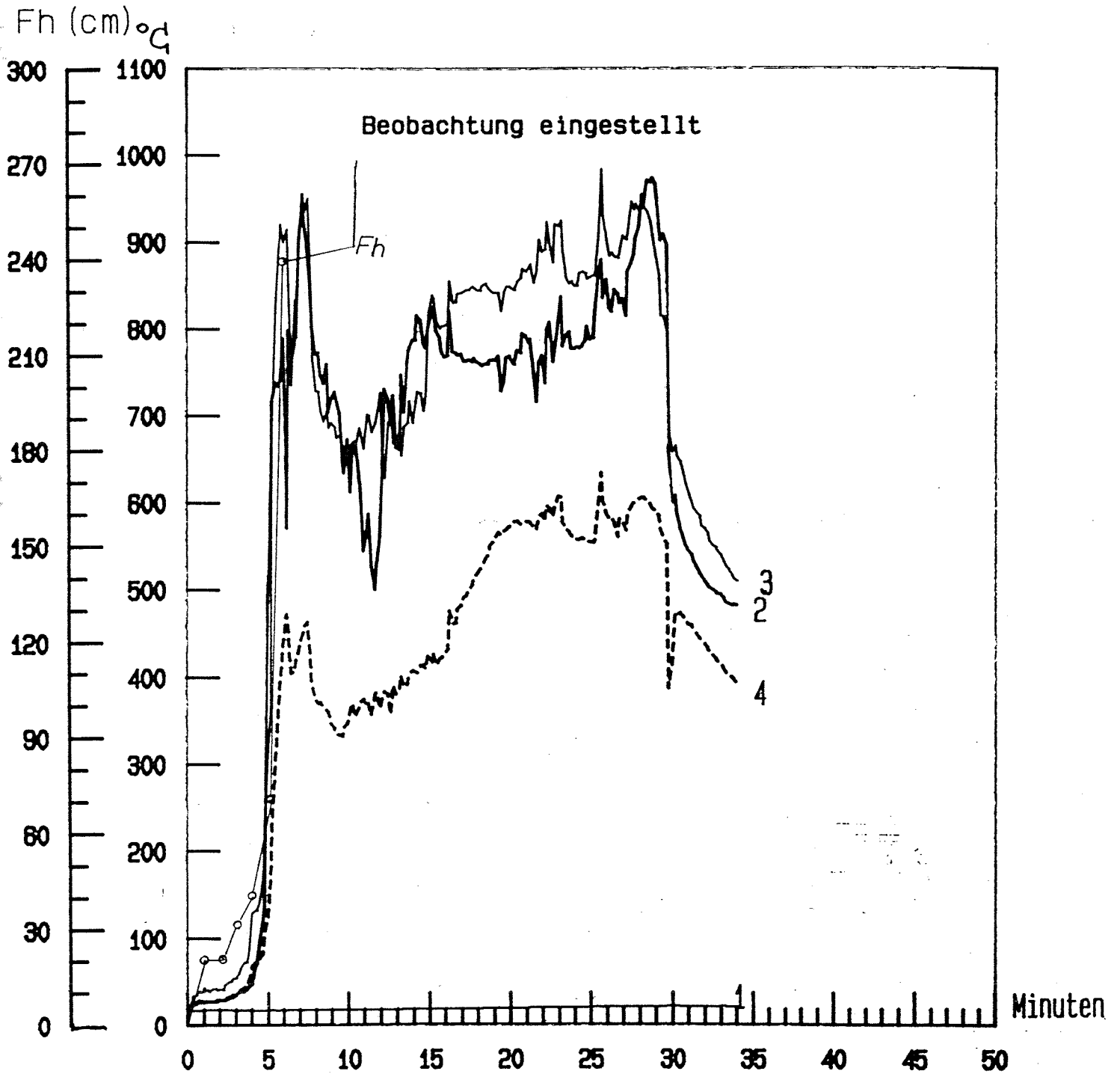
| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 19.3 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.3 | 19.2 | 19.2 | 19.3 | 19.3 | 19.3 | 19.3 |
| 1.00 | 38.3 | 38.5 | 36.7 | 36.8 | 35.2 | 36.0 | 35.3 | 35.0 | 34.3 | 32.5 | 34.0 | 33.2 | 26.4 |
| 2.00 | 40.6 | 40.8 | 40.5 | 40.5 | 39.1 | 39.7 | 38.6 | 38.6 | 37.7 | 36.1 | 37.5 | 36.7 | 27.8 |
| 3.00 | 54.3 | 55.6 | 54.7 | 55.6 | 53.7 | 53.8 | 52.5 | 51.7 | 50.5 | 47.7 | 49.9 | 49.1 | 35.5 |
| 4.00 | 128.5 | 120.8 | 118.5 | 118.2 | 113.1 | 117.4 | 111.9 | 111.6 | 106.6 | 96.2 | 109.3 | 106.2 | 73.0 |
| 5.00 | 315.5 | 296.5 | 278.6 | 272.2 | 255.1 | 257.6 | 246.9 | 242.6 | 230.1 | 206.1 | 228.6 | 215.8 | 143.6 |
| 6.00 | 899.9 | 880.4 | 863.0 | 868.2 | 844.6 | 853.5 | 818.9 | 803.4 | 779.4 | 725.8 | 741.5 | 707.0 | 563.9 |
| 7.00 | 904.8 | 871.1 | 845.1 | 819.4 | 789.0 | 775.6 | 751.3 | 727.5 | 704.4 | 670.4 | 668.8 | 648.5 | 494.7 |
| 8.00 | 728.9 | 683.0 | 669.2 | 648.7 | 644.5 | 623.8 | 610.0 | 591.5 | 572.6 | 572.9 | 548.4 | 546.5 | 445.4 |
| 9.00 | 692.1 | 670.1 | 649.9 | 640.8 | 624.3 | 616.7 | 603.9 | 585.8 | 562.1 | 533.9 | 512.7 | 501.0 | 395.0 |
| 10.00 | 668.1 | 662.5 | 682.1 | 712.4 | 694.2 | 698.8 | 669.7 | 634.1 | 596.1 | 536.6 | 512.0 | 489.0 | 382.8 |
| 11.00 | 662.9 | 657.6 | 654.6 | 681.7 | 684.5 | 689.9 | 674.2 | 648.3 | 627.7 | 594.7 | 600.6 | 585.0 | 463.9 |
| 12.00 | 726.9 | 710.9 | 684.9 | 674.6 | 634.3 | 608.8 | 591.4 | 572.2 | 559.4 | 551.6 | 523.3 | 504.7 | 396.3 |
| 13.00 | 676.9 | 648.3 | 625.9 | 628.4 | 608.1 | 605.4 | 593.0 | 581.6 | 563.2 | 541.9 | 544.9 | 541.1 | 431.5 |
| 14.00 | 691.9 | 676.4 | 651.5 | 668.7 | 656.9 | 641.9 | 644.0 | 631.3 | 608.5 | 581.2 | 580.6 | 567.9 | 464.7 |
| 15.00 | 819.0 | 803.7 | 829.6 | 861.5 | 839.6 | 839.0 | 818.8 | 787.4 | 754.6 | 700.3 | 689.2 | 656.1 | 490.4 |
| 16.00 | 804.1 | 804.3 | 816.0 | 838.8 | 837.1 | 824.9 | 813.0 | 788.8 | 762.5 | 723.4 | 692.8 | 661.4 | 522.0 |
| 17.00 | 842.0 | 843.3 | 847.4 | 856.8 | 857.4 | 859.0 | 869.5 | 849.1 | 827.2 | 798.5 | 781.2 | 755.6 | 620.2 |
| 18.00 | 845.0 | 846.9 | 869.6 | 891.7 | 890.2 | 891.6 | 906.0 | 881.3 | 851.8 | 829.3 | 808.3 | 782.7 | 654.2 |
| 19.00 | 841.8 | 844.2 | 860.0 | 884.7 | 893.3 | 897.5 | 912.7 | 893.9 | 875.9 | 857.8 | 838.7 | 815.3 | 694.7 |
| 20.00 | 848.6 | 850.2 | 865.9 | 893.5 | 913.9 | 941.6 | 957.3 | 918.8 | 893.4 | 874.3 | 851.0 | 825.4 | 700.6 |
| 21.00 | 865.8 | 867.1 | 887.8 | 916.1 | 927.6 | 947.9 | 952.0 | 915.7 | 889.1 | 870.5 | 845.6 | 823.5 | 701.5 |
| 22.00 | 888.9 | 891.6 | 913.0 | 941.8 | 935.8 | 938.2 | 940.9 | 927.6 | 911.0 | 880.5 | 871.5 | 847.7 | 706.8 |
| 23.00 | 918.6 | 923.2 | 885.3 | 886.0 | 866.4 | 868.2 | 872.1 | 874.5 | 871.9 | 864.3 | 859.7 | 841.0 | 717.6 |
| 24.00 | 849.7 | 846.9 | 855.5 | 894.3 | 900.8 | 898.6 | 891.3 | 870.2 | 850.8 | 825.5 | 809.8 | 787.6 | 697.4 |
| 25.00 | 859.9 | 856.4 | 863.4 | 896.2 | 916.7 | 914.8 | 903.7 | 881.1 | 860.6 | 827.7 | 807.5 | 780.6 | 685.0 |
| 26.00 | 903.3 | 900.9 | 921.7 | 933.0 | 920.1 | 916.2 | 907.3 | 891.6 | 876.2 | 853.7 | 834.5 | 813.8 | 721.4 |
| 27.00 | 906.7 | 898.2 | 871.7 | 859.6 | 845.2 | 847.2 | 850.8 | 845.4 | 840.5 | 821.3 | 809.4 | 795.6 | 701.1 |
| 28.00 | 934.5 | 929.9 | 909.8 | 899.3 | 881.6 | 888.9 | 890.0 | 888.1 | 882.8 | 866.9 | 857.3 | 834.2 | 721.0 |
| 29.00 | 886.1 | 875.0 | 859.9 | 830.0 | 797.0 | 789.6 | 795.6 | 807.0 | 814.6 | 808.8 | 800.7 | 791.0 | 681.4 |
| 30.00 | 658.3 | 653.1 | 648.1 | 615.0 | 606.8 | 596.6 | 607.1 | 619.2 | 620.0 | 627.8 | 606.0 | 608.7 | 484.0 |
| 31.00 | 612.0 | 616.3 | 592.1 | 562.1 | 549.8 | 557.2 | 574.6 | 595.5 | 605.2 | 609.8 | 599.3 | 595.7 | 500.7 |
| 32.00 | 570.1 | 562.1 | 535.6 | 515.9 | 512.5 | 525.5 | 544.6 | 556.7 | 567.5 | 570.6 | 560.9 | 559.5 | 473.0 |
| 33.00 | 540.0 | 530.2 | 508.3 | 496.1 | 494.4 | 500.8 | 515.1 | 527.8 | 536.7 | 540.2 | 531.8 | 530.6 | 446.3 |

Temperaturen der Meßstellen 15 bis 27 bei Versuch 45.1

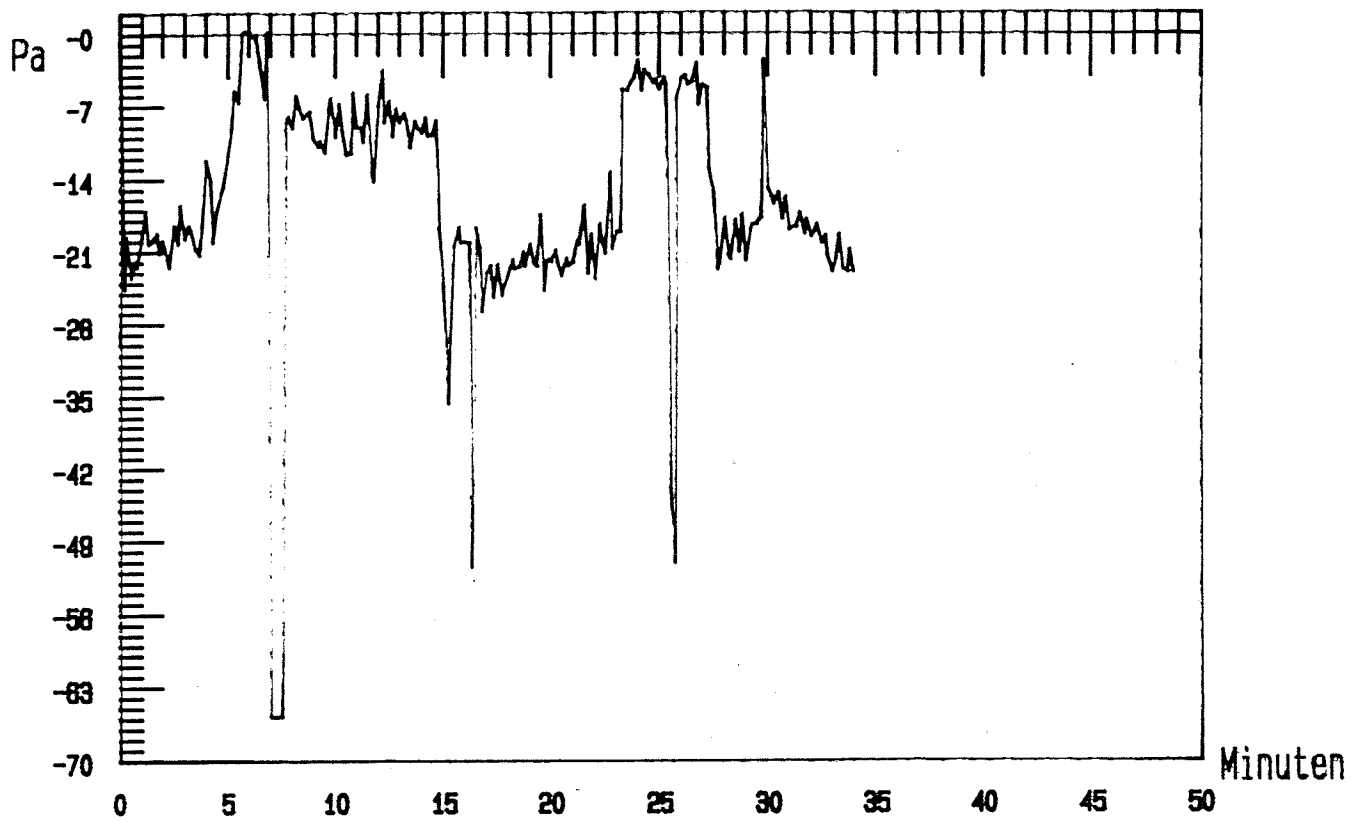
Zeit/Mst
(min)

| | 28 | 29 | 30 |
|-------|-------|-------|-------|
| 0.00 | 19.3 | 19.4 | 19.3 |
| 1.00 | 19.8 | 31.6 | 27.8 |
| 2.00 | 20.1 | 35.5 | 31.1 |
| 3.00 | 21.1 | 47.6 | 38.5 |
| 4.00 | 24.4 | 101.5 | 73.1 |
| 5.00 | 33.6 | 193.6 | 154.7 |
| 6.00 | 187.1 | 621.9 | 491.6 |
| 7.00 | 235.4 | 560.1 | 496.3 |
| 8.00 | 199.8 | 478.8 | 447.7 |
| 9.00 | 174.8 | 447.0 | 418.9 |
| 10.00 | 173.5 | 441.4 | 424.4 |
| 11.00 | 192.0 | 497.4 | 433.1 |
| 12.00 | 187.8 | 475.1 | 428.7 |
| 13.00 | 198.7 | 465.8 | 477.1 |
| 14.00 | 207.4 | 534.8 | 482.2 |
| 15.00 | 241.0 | 535.0 | 505.8 |
| 16.00 | 260.6 | 532.8 | 488.0 |
| 17.00 | 316.5 | 578.9 | 552.2 |
| 18.00 | 355.7 | 617.1 | 582.1 |
| 19.00 | 395.7 | 652.9 | 624.2 |
| 20.00 | 416.5 | 665.5 | 636.5 |
| 21.00 | 432.3 | 660.7 | 642.4 |
| 22.00 | 435.7 | 666.3 | 660.2 |
| 23.00 | 446.7 | 693.9 | 682.2 |
| 24.00 | 438.6 | 638.9 | 597.0 |
| 25.00 | 436.7 | 633.6 | 597.1 |
| 26.00 | 474.1 | 658.7 | 631.7 |
| 27.00 | 454.2 | 676.0 | 611.5 |
| 28.00 | 480.6 | 688.2 | 646.4 |
| 29.00 | 454.6 | 690.2 | 630.8 |
| 30.00 | 175.3 | 538.0 | 532.4 |
| 31.00 | 338.7 | 524.0 | 520.8 |
| 32.00 | 326.6 | 496.6 | 493.7 |
| 33.00 | 315.4 | 471.0 | 460.7 |

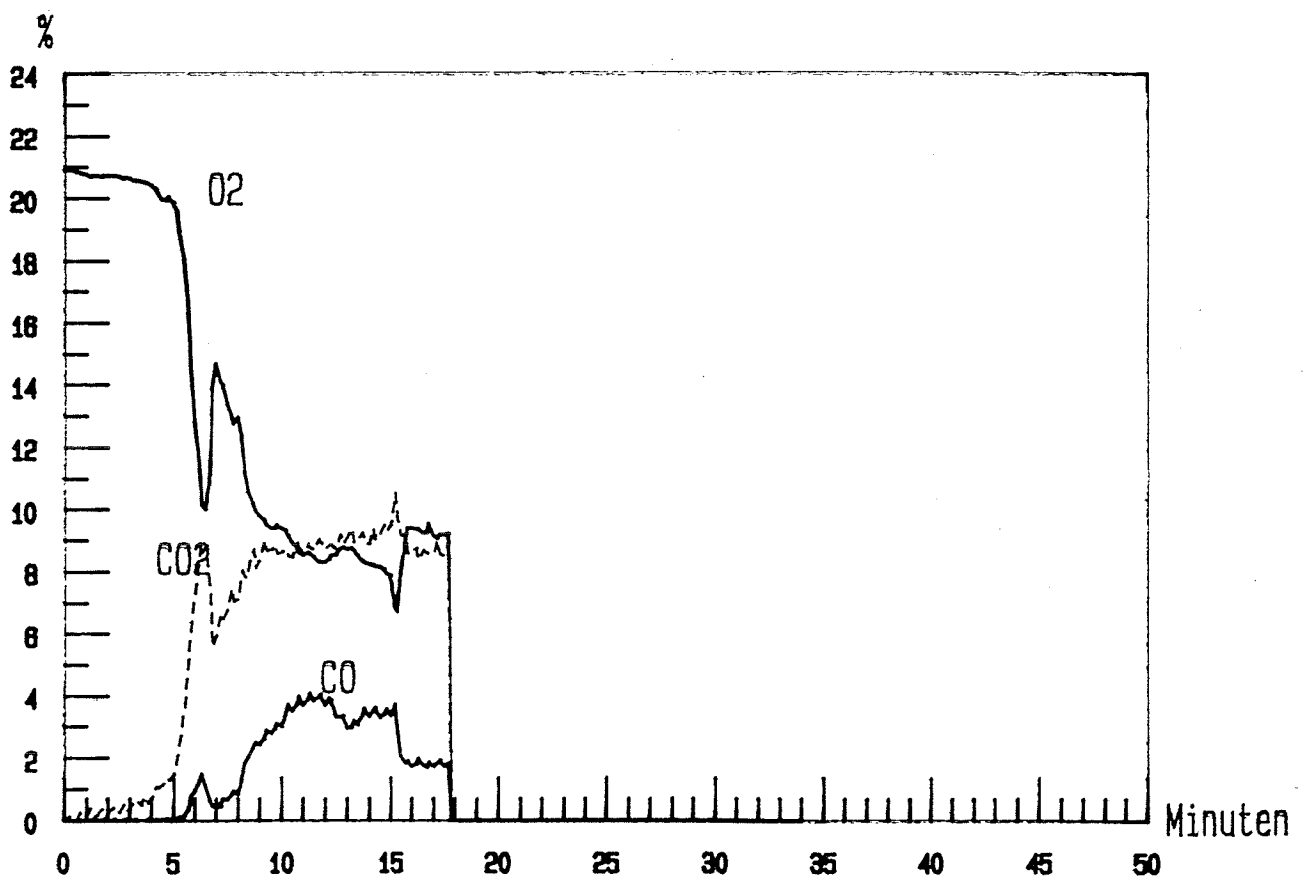
Temperaturen der Meßstellen 28 bis 30 bei Versuch 45.1



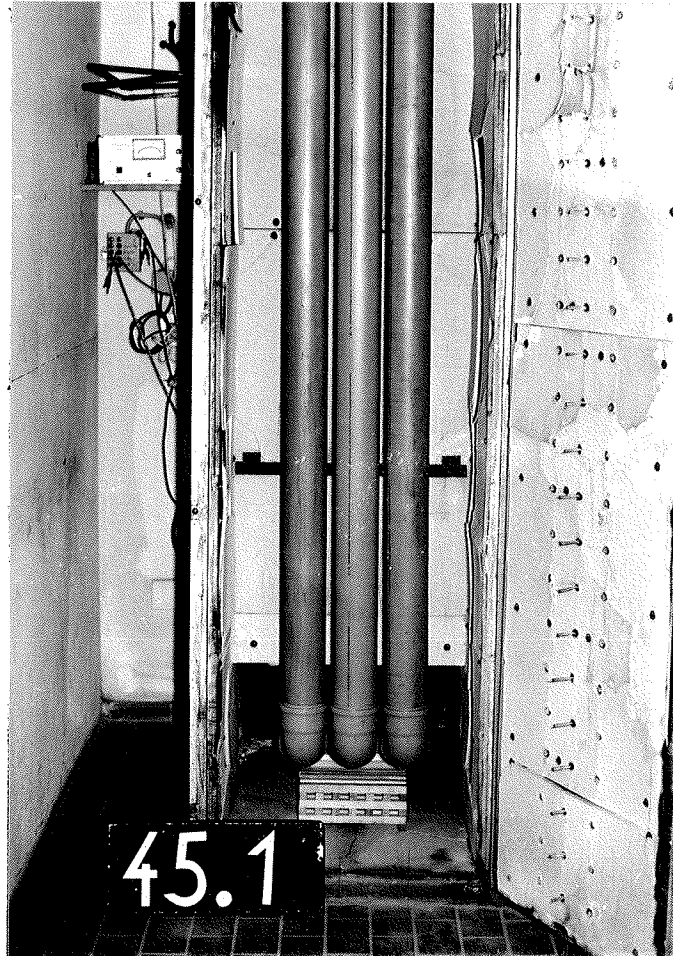
Temperatur und Flammenhoehe bei Versuch 45.1



Druckverlauf im Brandraum bei Versuch 45.1



CO₂, CO, O₂-Gehalt bei Versuch 45.1



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 45.2

Materialbeschreibung

Material Nr. 10 : 1 Abwasserrohr
aus Polypropylen

Abmessungen

Innendurchmesser/Außendurchmesser: 103,5 mm/109,5 mm
Zwischenraum zwischen den Proben : -

Beobachtungen während des Brandversuches Nr. 45.2 am 01.10.1987

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung der Holzkrippe (2 kg) mit 2 mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 0' 35" | Am horizontalen Schenkel tropft das Material brennend ab. |
| 1' 30" | Das Material verformt sich im Bereich des Knies und brennt mit. |
| 2' | Im Bereich des Knies reißt das Material auf und tropft ab und brennt am Boden weiter. |
| 2' 45" | Das Material im Bereich des Knies ist völlig zer- stört. |
| 4' | Das Material verformt sich in ca. 1,20 m Höhe. |
| 4' 30" | In diesem Bereich tropft das Material brennend ab und brennt auf dem Boden der Versuchseinrich- tung weiter. |
| 4' 45" | Das Abwasserrohr ist auf den Boden der Versuchs- einrichtung gefallen und brennt dort mit ca. 1,60 m hohen Flammen mit. |
| 6' 45" | Ausfall der Zündüberwachung. |
| 9'- 20' | Das auf dem Boden liegende Material brennt ohne zusätzliche Gas- und Luftzufuhr mit. |
| 20' | Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0 mm

Das eingesetzte Versuchsmaterial ist vollständig verbrannt.

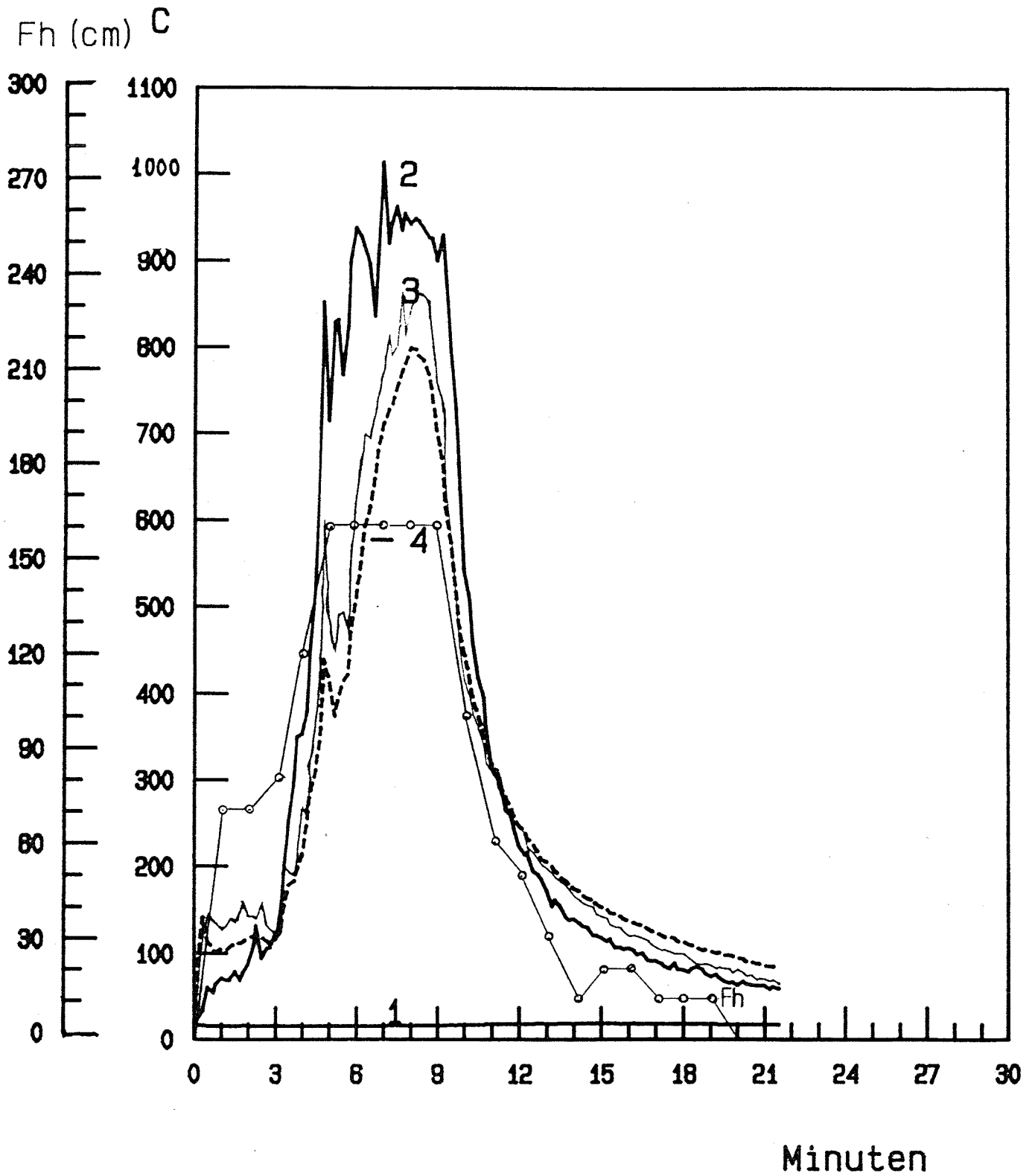
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 16.5 | 20.5 | 45.6 | 19.5 | 18.7 | 18.3 | 17.9 | 20.7 | 23.1 | 18.1 | 18.2 | 18.5 | 18.6 | 18.7 |
| 1.00 | 15.7 | 104.1 | 122.7 | 108.7 | 55.2 | 71.1 | 137.3 | 184.2 | 217.0 | 209.5 | 178.2 | 155.5 | 143.1 | 136.5 |
| 2.00 | 15.9 | 120.4 | 94.7 | 118.4 | 66.1 | 87.3 | 170.3 | 204.5 | 256.6 | 236.6 | 195.7 | 166.9 | 153.0 | 150.1 |
| 3.00 | 16.3 | 120.7 | 92.7 | 114.2 | 94.5 | 122.5 | 182.8 | 196.4 | 182.6 | 177.4 | 154.8 | 136.4 | 130.4 | 128.7 |
| 4.00 | 15.8 | 216.9 | 237.7 | 222.6 | 366.4 | 353.3 | 367.3 | 360.0 | 361.5 | 369.9 | 340.5 | 304.4 | 296.5 | 282.6 |
| 5.00 | 15.6 | 483.7 | 436.1 | 486.4 | 449.3 | 714.6 | 669.6 | 615.8 | 554.0 | 525.2 | 506.6 | 491.1 | 490.2 | 506.2 |
| 6.00 | 15.8 | 553.1 | 511.1 | 576.3 | 859.5 | 937.8 | 852.4 | 768.4 | 734.6 | 697.7 | 667.5 | 642.3 | 639.6 | 645.9 |
| 7.00 | 16.1 | 816.7 | 615.4 | 734.8 | 885.8 | 1014.4 | 937.1 | 864.0 | 841.2 | 822.0 | 799.8 | 777.8 | 776.6 | 776.0 |
| 8.00 | 16.0 | 852.8 | 729.5 | 904.2 | 965.2 | 942.4 | 856.9 | 841.1 | 807.9 | 803.1 | 796.6 | 802.3 | 810.1 | 842.2 |
| 9.00 | 16.5 | 742.6 | 734.0 | 818.1 | 942.8 | 899.8 | 822.7 | 804.9 | 773.5 | 748.8 | 745.1 | 747.1 | 754.4 | 759.3 |
| 10.00 | 17.2 | 481.0 | 468.5 | 484.7 | 662.1 | 543.9 | 447.5 | 458.7 | 393.1 | 375.1 | 388.4 | 412.1 | 407.2 | 416.3 |
| 11.00 | 17.9 | 351.2 | 372.0 | 334.5 | 397.0 | 314.0 | 262.8 | 302.1 | 268.3 | 265.6 | 279.5 | 301.3 | 302.4 | 307.7 |
| 12.00 | 18.2 | 275.2 | 290.9 | 263.0 | 298.9 | 223.9 | 188.3 | 224.2 | 205.4 | 204.8 | 218.2 | 236.3 | 243.3 | 238.9 |
| 13.00 | 18.5 | 227.5 | 242.6 | 217.3 | 237.2 | 172.0 | 141.3 | 173.9 | 157.8 | 156.9 | 168.7 | 185.5 | 193.9 | 191.8 |
| 14.00 | 18.5 | 194.4 | 194.6 | 184.2 | 181.9 | 139.2 | 113.6 | 137.2 | 125.9 | 126.3 | 137.5 | 151.6 | 158.8 | 159.8 |
| 15.00 | 18.7 | 166.5 | 165.4 | 162.6 | 152.1 | 117.7 | 95.7 | 114.7 | 107.1 | 108.1 | 117.6 | 129.0 | 137.4 | 137.7 |
| 16.00 | 18.3 | 148.5 | 153.1 | 145.7 | 139.3 | 105.7 | 86.5 | 98.9 | 91.0 | 90.4 | 98.0 | 106.8 | 112.5 | 115.5 |
| 17.00 | 18.2 | 132.4 | 136.1 | 128.6 | 124.1 | 90.7 | 73.9 | 85.0 | 79.7 | 78.1 | 82.5 | 90.1 | 98.0 | 102.2 |
| 18.00 | 18.2 | 119.8 | 121.1 | 116.8 | 104.5 | 80.6 | 66.3 | 74.1 | 70.6 | 71.9 | 77.7 | 83.4 | 92.1 | 94.8 |
| 19.00 | 17.9 | 108.0 | 109.8 | 107.4 | 100.6 | 72.9 | 56.5 | 64.8 | 60.4 | 60.4 | 65.5 | 71.2 | 78.9 | 81.6 |
| 20.00 | 17.5 | 100.1 | 95.0 | 95.7 | 83.3 | 62.9 | 52.8 | 58.5 | 57.3 | 58.8 | 63.7 | 67.8 | 76.1 | 78.0 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 18.9 | 18.7 | 19.0 | 19.3 | 19.5 | 19.3 | 19.5 | 19.6 | 19.6 | 20.0 | 19.7 | 19.7 | 20.1 |
| 1.00 | 125.7 | 128.7 | 121.2 | 116.3 | 110.9 | 113.5 | 111.5 | 110.2 | 111.4 | 106.3 | 110.2 | 110.6 | 102.3 |
| 2.00 | 142.4 | 141.8 | 135.5 | 132.6 | 131.7 | 134.5 | 130.7 | 128.3 | 126.6 | 119.3 | 121.5 | 121.4 | 115.2 |
| 3.00 | 121.0 | 121.6 | 120.7 | 120.3 | 120.0 | 121.8 | 118.6 | 117.7 | 117.4 | 112.5 | 115.4 | 116.6 | 113.4 |
| 4.00 | 268.7 | 263.5 | 246.5 | 229.6 | 225.7 | 228.1 | 219.5 | 217.9 | 219.7 | 208.4 | 221.9 | 222.6 | 209.5 |
| 5.00 | 483.1 | 484.0 | 480.9 | 472.3 | 459.6 | 464.1 | 457.5 | 451.0 | 456.5 | 433.5 | 434.9 | 434.4 | 409.1 |
| 6.00 | 627.4 | 626.6 | 633.4 | 626.0 | 613.7 | 614.6 | 594.3 | 592.4 | 587.9 | 561.2 | 568.5 | 561.0 | 528.6 |
| 7.00 | 770.4 | 768.3 | 779.3 | 780.7 | 782.9 | 789.6 | 785.4 | 788.1 | 791.4 | 785.6 | 784.0 | 784.3 | 761.0 |
| 8.00 | 845.2 | 853.4 | 874.8 | 885.3 | 889.9 | 893.9 | 892.3 | 894.7 | 897.8 | 891.8 | 888.9 | 888.4 | 867.7 |
| 9.00 | 756.7 | 755.6 | 761.6 | 765.0 | 766.8 | 758.9 | 764.0 | 764.3 | 765.8 | 770.5 | 756.7 | 754.1 | 745.9 |
| 10.00 | 415.9 | 404.9 | 422.5 | 434.5 | 447.4 | 428.4 | 446.8 | 453.4 | 456.7 | 482.1 | 457.4 | 458.3 | 473.3 |
| 11.00 | 309.1 | 297.6 | 310.8 | 322.7 | 329.4 | 314.9 | 324.4 | 325.4 | 325.1 | 346.3 | 323.5 | 321.9 | 335.3 |
| 12.00 | 244.9 | 234.3 | 246.4 | 255.9 | 262.5 | 247.0 | 253.6 | 254.5 | 254.7 | 271.8 | 252.3 | 249.1 | 261.2 |
| 13.00 | 197.3 | 188.8 | 199.8 | 207.6 | 214.6 | 200.5 | 205.9 | 206.9 | 209.0 | 223.1 | 207.5 | 205.1 | 216.1 |
| 14.00 | 165.2 | 159.0 | 168.3 | 176.0 | 181.9 | 171.7 | 175.5 | 175.4 | 177.6 | 188.7 | 174.9 | 172.9 | 181.3 |
| 15.00 | 142.3 | 137.0 | 145.2 | 151.1 | 157.4 | 148.7 | 153.8 | 154.5 | 156.8 | 167.3 | 155.6 | 153.6 | 161.5 |
| 16.00 | 119.8 | 116.7 | 125.6 | 132.9 | 139.7 | 131.2 | 135.5 | 136.7 | 139.0 | 149.0 | 139.5 | 138.0 | 144.2 |
| 17.00 | 106.1 | 103.0 | 112.2 | 119.1 | 125.1 | 118.4 | 122.5 | 124.6 | 125.7 | 133.8 | 124.8 | 122.4 | 128.2 |
| 18.00 | 99.2 | 96.9 | 103.1 | 108.8 | 114.2 | 109.2 | 112.1 | 113.4 | 115.7 | 123.3 | 115.6 | 113.4 | 118.6 |
| 19.00 | 85.8 | 84.0 | 90.0 | 95.9 | 101.4 | 96.3 | 99.8 | 101.9 | 103.3 | 110.9 | 103.6 | 102.8 | 107.8 |
| 20.00 | 80.9 | 79.5 | 85.0 | 90.4 | 95.4 | 91.6 | 93.6 | 95.4 | 96.3 | 101.7 | 95.7 | 94.2 | 98.7 |

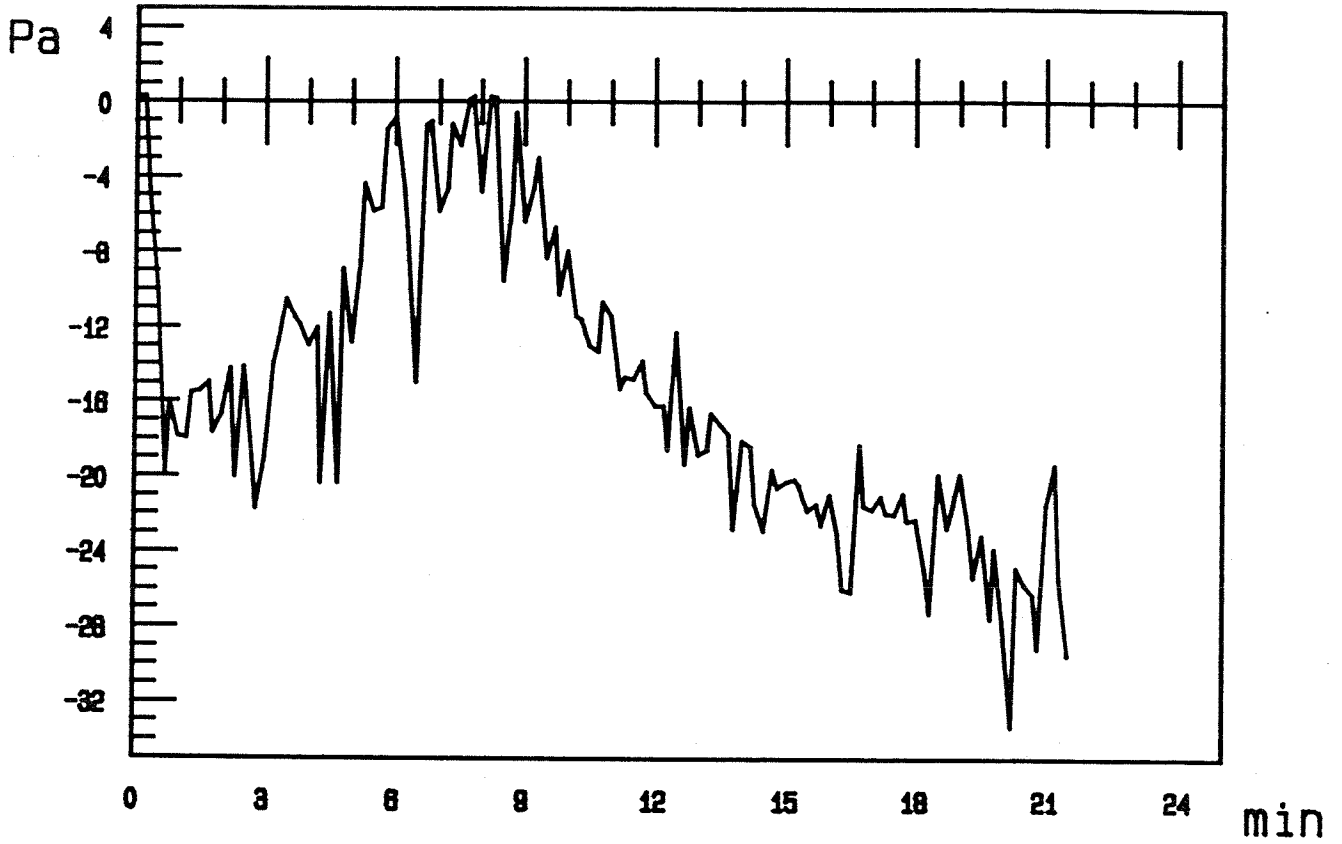
Temperaturen der Meßstellen 1 bis 27 bei Versuch 45.2

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 20.0 | 19.9 | 20.5 |
| 1.00 | 106.3 | 108.0 | 100.2 |
| 2.00 | 119.4 | 120.3 | 112.7 |
| 3.00 | 114.5 | 127.5 | 107.5 |
| 4.00 | 214.0 | 222.5 | 200.6 |
| 5.00 | 423.8 | 449.5 | 373.4 |
| 6.00 | 529.5 | 555.1 | 448.9 |
| 7.00 | 763.5 | 762.1 | 604.2 |
| 8.00 | 856.9 | 825.8 | 713.7 |
| 9.00 | 734.6 | 704.4 | 656.3 |
| 10.00 | 459.0 | 447.0 | 436.0 |
| 11.00 | 323.0 | 314.5 | 319.6 |
| 12.00 | 251.4 | 241.4 | 248.6 |
| 13.00 | 206.2 | 198.4 | 209.6 |
| 14.00 | 173.5 | 169.0 | 180.5 |
| 15.00 | 154.6 | 147.2 | 156.7 |
| 16.00 | 137.9 | 130.6 | 140.6 |
| 17.00 | 122.3 | 116.7 | 128.1 |
| 18.00 | 114.0 | 108.1 | 116.7 |
| 19.00 | 103.2 | 97.1 | 105.6 |
| 20.00 | 95.2 | 91.1 | 99.1 |

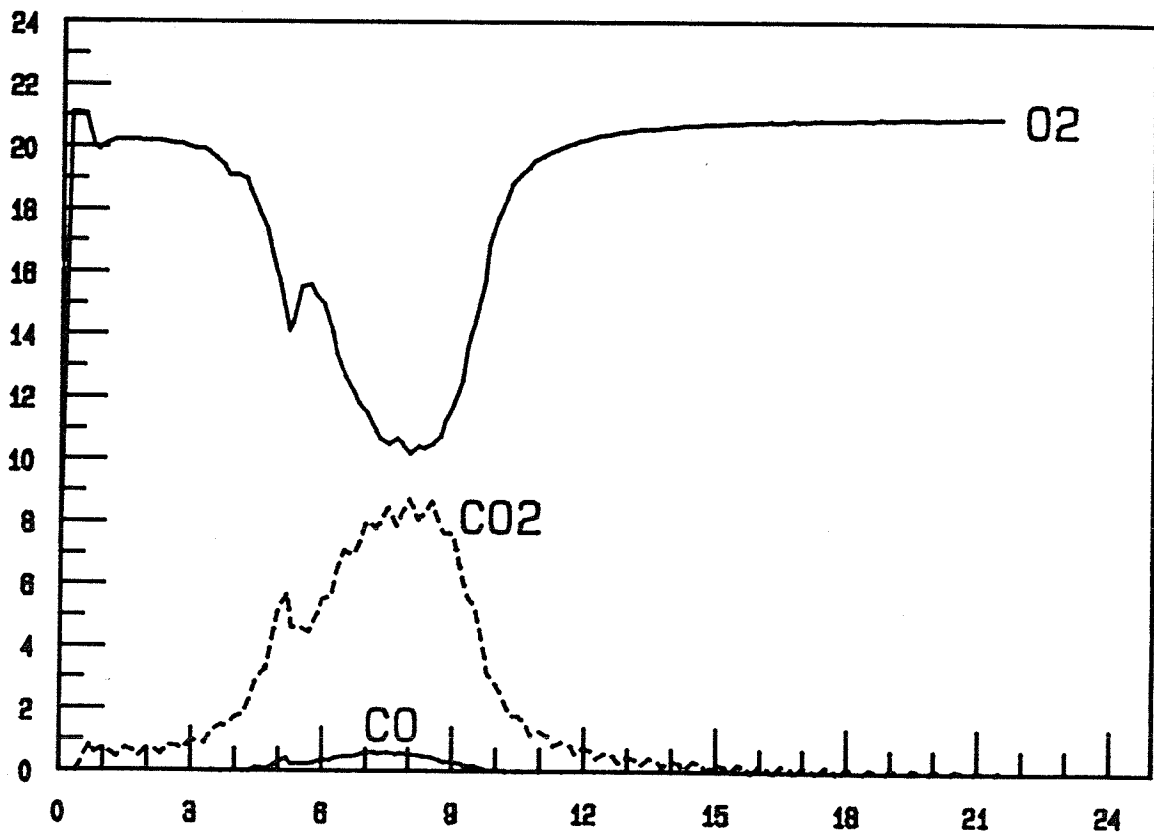
Temperaturen der Meßstellen 28 bis 30 bei Versuch 45.2



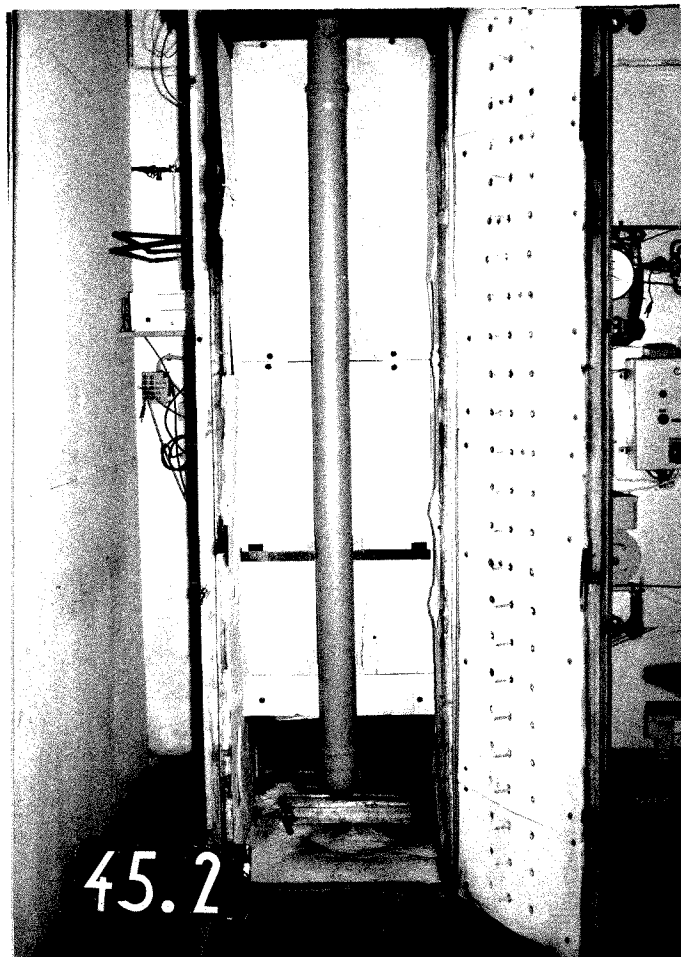
Temperatur und Flammenhoehe bei Versuch 45.2



Druckverlauf im Brandraum bei Versuch 45.2



CO₂, CO, O₂-Gehalt bei Versuch 45.2 Minuten



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 45.3

Materialbeschreibung

Material Nr. 10 : 1 Abwasserrohr
aus Polypropylen

Abmessungen

Innendurchmesser/Außendurchmesser: 103,5 mm/109,5 mm
Zwischenraum zwischen den Proben : -

Beobachtungen während des Brandversuches Nr. 45.3 am 07.10.1987

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|--|
| 0' | Zündung der Holzkrippe (2 kg) durch zwei mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 3' | Material tropft brennend ab und brennt mit. |
| 4' 30" | Knie ist abgebrannt. |
| 5' | Material voll in Flammen. |
| 6' | Rauch tritt aus dem Ofen. |
| 7' | Absperrung der Zuluft, um Beschädigung der Versuchseinrichtung zu vermeiden. Intensives Brandgeschehen. |
| 8' - 12' | Material brennt am Boden weiter. |
| 20' | Material ausgebrannt, Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0

Das eingesetzte Versuchsmaterial ist vollständig verbrannt.

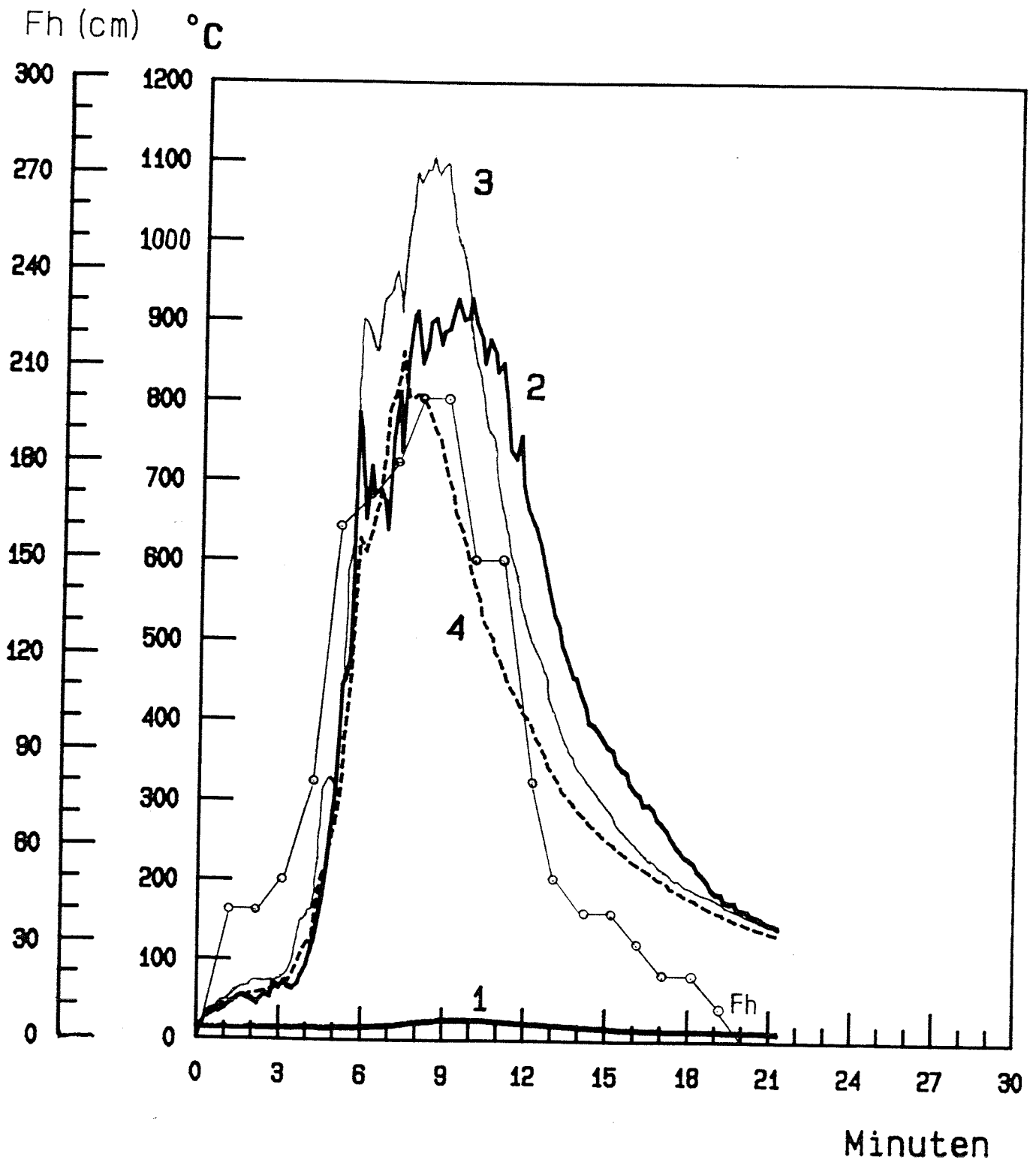
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| 0.00 | 13.7 | 17.3 | 16.3 | 16.8 | 15.7 | 16.0 | 15.7 | 15.3 | 15.6 | 16.0 | 16.2 | 16.3 | 17.2 | 17.7 |
| 1.00 | 14.0 | 41.7 | 43.4 | 48.3 | 33.2 | 38.3 | 49.0 | 52.1 | 53.6 | 55.0 | 51.5 | 49.7 | 50.9 | 51.1 |
| 2.00 | 14.0 | 57.3 | 54.8 | 64.2 | 40.1 | 49.1 | 70.9 | 81.8 | 90.0 | 90.9 | 88.9 | 83.2 | 79.8 | 76.1 |
| 3.00 | 13.9 | 68.4 | 66.6 | 76.4 | 46.3 | 64.1 | 85.9 | 97.3 | 100.2 | 97.5 | 92.1 | 87.1 | 83.3 | 81.9 |
| 4.00 | 14.1 | 124.9 | 128.0 | 129.8 | 74.0 | 92.8 | 135.6 | 168.0 | 213.5 | 226.3 | 206.7 | 184.5 | 181.9 | 168.1 |
| 5.00 | 14.0 | 300.8 | 645.2 | 369.9 | 256.8 | 312.5 | 461.8 | 502.6 | 483.5 | 455.7 | 408.2 | 368.8 | 358.6 | 338.5 |
| 6.00 | 15.3 | 625.4 | 653.0 | 742.8 | 704.9 | 651.9 | 746.6 | 803.1 | 838.4 | 879.5 | 878.2 | 868.2 | 891.6 | 897.3 |
| 7.00 | 17.0 | 815.4 | 841.1 | 971.3 | 758.1 | 753.6 | 787.5 | 817.5 | 858.7 | 933.7 | 929.9 | 920.0 | 940.6 | 964.4 |
| 8.00 | 21.5 | 830.5 | 897.4 | 1031.9 | 785.3 | 846.2 | 870.9 | 906.7 | 956.5 | 989.8 | 1023.7 | 1057.8 | 1085.0 | 1090.9 |
| 9.00 | 24.2 | 732.7 | 840.9 | 939.3 | 706.5 | 889.2 | 967.0 | 1016.7 | 1065.2 | 1096.2 | 1108.3 | 1100.6 | 1105.5 | 1090.3 |
| 10.00 | 24.4 | 610.2 | 724.9 | 749.9 | 705.1 | 897.2 | 959.9 | 959.3 | 959.6 | 956.0 | 938.7 | 918.9 | 894.6 | 871.4 |
| 11.00 | 22.6 | 494.9 | 604.9 | 602.9 | 643.0 | 847.5 | 881.6 | 838.7 | 814.4 | 784.0 | 763.4 | 744.2 | 715.3 | 693.7 |
| 12.00 | 20.3 | 404.7 | 504.9 | 505.2 | 544.3 | 665.3 | 663.4 | 655.3 | 616.2 | 613.2 | 591.7 | 568.5 | 543.7 | 529.4 |
| 13.00 | 18.4 | 338.2 | 419.2 | 397.2 | 461.2 | 532.1 | 530.7 | 505.5 | 485.6 | 470.4 | 456.3 | 443.4 | 424.4 | 409.6 |
| 14.00 | 16.5 | 289.3 | 357.1 | 344.4 | 382.8 | 434.3 | 434.3 | 416.1 | 385.2 | 346.8 | 336.3 | 331.3 | 333.7 | 317.4 |
| 15.00 | 15.0 | 253.3 | 318.0 | 300.3 | 331.8 | 367.6 | 345.8 | 361.6 | 320.2 | 296.1 | 288.1 | 285.7 | 293.3 | 278.3 |
| 16.00 | 13.4 | 223.2 | 276.0 | 280.7 | 285.9 | 311.6 | 290.6 | 299.7 | 263.6 | 227.7 | 227.2 | 229.5 | 247.6 | 220.7 |
| 17.00 | 12.4 | 200.2 | 241.0 | 252.0 | 251.3 | 271.0 | 248.2 | 253.5 | 225.9 | 196.8 | 200.4 | 200.7 | 219.6 | 192.3 |
| 18.00 | 11.6 | 179.9 | 234.7 | 210.4 | 211.9 | 226.8 | 206.0 | 215.5 | 201.2 | 183.2 | 183.8 | 183.3 | 197.3 | 175.6 |
| 19.00 | 11.4 | 165.5 | 230.0 | 183.6 | 178.0 | 184.2 | 175.6 | 187.0 | 178.3 | 165.8 | 167.6 | 168.1 | 183.1 | 164.6 |
| 20.00 | 10.9 | 151.8 | 206.9 | 163.7 | 160.8 | 163.9 | 153.2 | 165.2 | 161.5 | 148.7 | 149.8 | 152.7 | 166.9 | 147.9 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 17.5 | 17.7 | 17.8 | 17.6 | 17.7 | 17.7 | 17.6 | 17.7 | 17.6 | 17.5 | 18.1 | 18.2 | 18.0 |
| 1.00 | 50.2 | 51.8 | 49.8 | 47.7 | 46.3 | 49.0 | 46.3 | 46.5 | 46.0 | 42.5 | 45.9 | 46.6 | 44.0 |
| 2.00 | 74.3 | 73.6 | 69.4 | 66.7 | 64.8 | 65.9 | 62.9 | 62.6 | 61.7 | 58.4 | 61.3 | 61.3 | 57.9 |
| 3.00 | 80.6 | 80.3 | 78.8 | 75.7 | 74.4 | 76.1 | 73.1 | 72.6 | 72.4 | 68.6 | 71.4 | 71.7 | 68.2 |
| 4.00 | 162.4 | 158.5 | 151.5 | 144.0 | 141.8 | 145.6 | 137.6 | 135.5 | 133.4 | 122.5 | 129.6 | 130.6 | 121.1 |
| 5.00 | 322.1 | 314.0 | 295.9 | 276.9 | 265.1 | 268.8 | 259.9 | 258.7 | 264.6 | 244.2 | 261.1 | 265.4 | 246.4 |
| 6.00 | 890.6 | 886.4 | 866.2 | 851.6 | 839.9 | 838.1 | 813.9 | 792.8 | 778.6 | 739.1 | 732.3 | 718.9 | 671.7 |
| 7.00 | 964.1 | 972.3 | 981.8 | 978.0 | 971.5 | 963.2 | 958.6 | 952.6 | 947.9 | 928.2 | 922.7 | 912.6 | 882.4 |
| 8.00 | 1089.2 | 1086.2 | 1062.0 | 1011.3 | 994.1 | 975.9 | 952.3 | 941.2 | 943.2 | 936.5 | 907.8 | 900.7 | 854.9 |
| 9.00 | 1067.5 | 1043.9 | 993.1 | 885.0 | 838.3 | 804.4 | 794.0 | 786.8 | 791.8 | 798.6 | 776.2 | 767.9 | 743.0 |
| 10.00 | 848.1 | 813.0 | 776.5 | 680.4 | 643.3 | 609.5 | 615.9 | 603.3 | 611.6 | 637.2 | 614.8 | 615.0 | 592.8 |
| 11.00 | 670.4 | 651.6 | 613.3 | 519.9 | 506.1 | 489.2 | 500.3 | 489.9 | 497.4 | 523.1 | 498.5 | 501.5 | 479.7 |
| 12.00 | 517.4 | 510.0 | 440.5 | 389.6 | 406.3 | 403.1 | 406.6 | 399.4 | 407.5 | 437.1 | 411.6 | 419.8 | 407.5 |
| 13.00 | 408.6 | 403.4 | 344.0 | 301.7 | 321.7 | 326.1 | 332.7 | 330.2 | 342.3 | 370.9 | 338.7 | 347.0 | 339.4 |
| 14.00 | 334.4 | 339.2 | 259.4 | 245.6 | 260.8 | 266.6 | 273.6 | 278.0 | 290.3 | 313.9 | 283.6 | 292.6 | 287.5 |
| 15.00 | 291.7 | 292.1 | 220.6 | 211.9 | 220.9 | 229.5 | 238.5 | 244.3 | 255.1 | 272.9 | 248.1 | 255.3 | 249.6 |
| 16.00 | 241.9 | 245.9 | 174.9 | 183.2 | 189.7 | 196.6 | 208.1 | 215.8 | 224.9 | 238.3 | 220.7 | 224.1 | 218.0 |
| 17.00 | 211.7 | 217.7 | 150.5 | 160.0 | 165.5 | 173.4 | 183.2 | 191.3 | 201.8 | 209.7 | 196.8 | 200.8 | 194.7 |
| 18.00 | 191.2 | 192.5 | 138.1 | 144.6 | 149.0 | 158.4 | 164.6 | 172.3 | 180.2 | 186.5 | 173.2 | 179.9 | 173.7 |
| 19.00 | 176.2 | 176.2 | 132.1 | 131.4 | 136.5 | 144.2 | 149.0 | 156.3 | 163.7 | 168.0 | 157.1 | 164.9 | 157.2 |
| 20.00 | 158.7 | 160.1 | 121.9 | 120.3 | 125.2 | 132.8 | 135.4 | 142.3 | 149.5 | 151.7 | 143.5 | 149.8 | 142.0 |

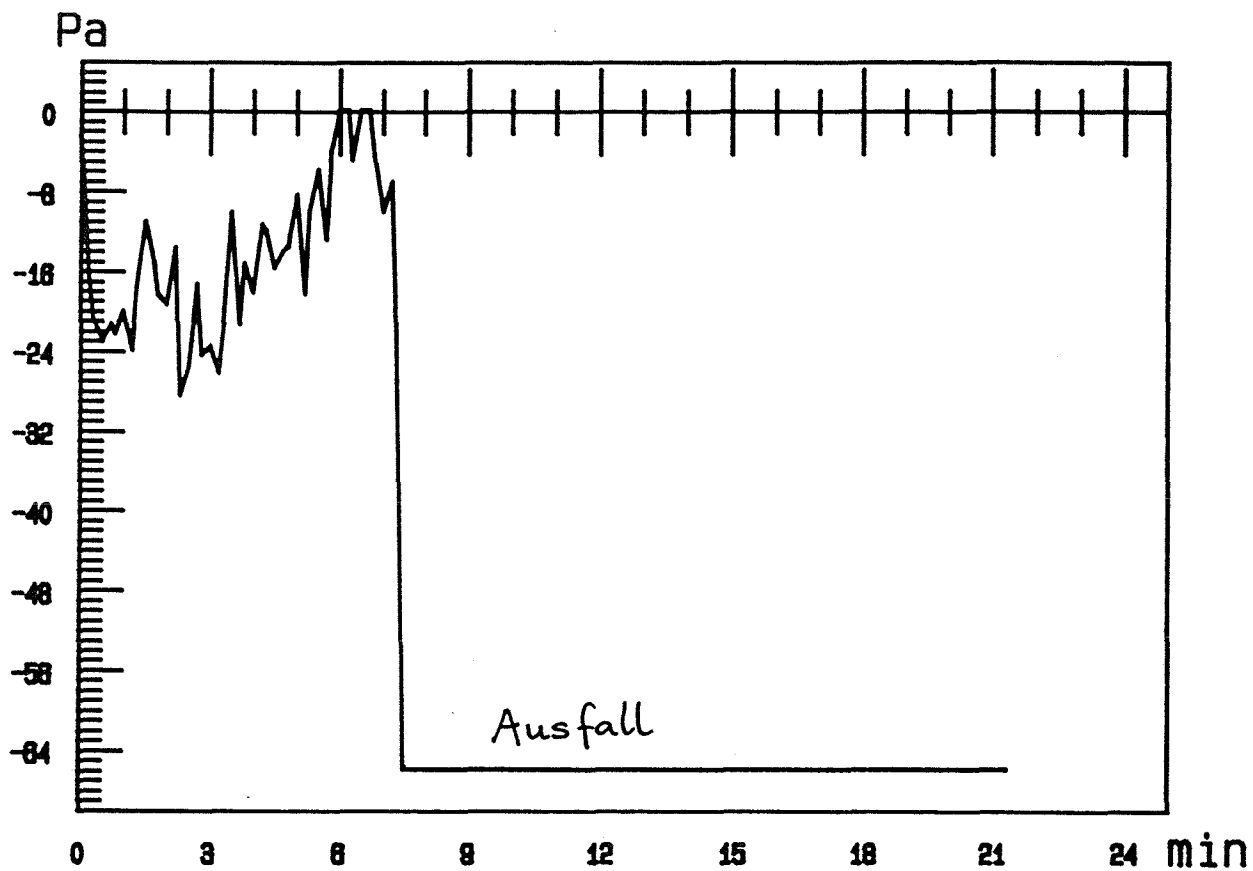
Temperaturen der Meßstellen 1 bis 27 bei Versuch 45.3

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 18.1 | 17.6 | 18.0 |
| 1.00 | 46.0 | 45.1 | 42.2 |
| 2.00 | 59.4 | 59.8 | 54.9 |
| 3.00 | 68.2 | 69.0 | 65.4 |
| 4.00 | 125.2 | 128.7 | 114.0 |
| 5.00 | 258.7 | 291.3 | 264.7 |
| 6.00 | 663.1 | 633.0 | 539.1 |
| 7.00 | 869.7 | 815.7 | 728.7 |
| 8.00 | 852.2 | 791.8 | 774.9 |
| 9.00 | 733.6 | 693.6 | 679.3 |
| 10.00 | 594.3 | 576.2 | 545.9 |
| 11.00 | 488.3 | 472.6 | 459.1 |
| 12.00 | 414.0 | 399.9 | 399.7 |
| 13.00 | 340.8 | 328.7 | 330.2 |
| 14.00 | 288.3 | 279.8 | 285.2 |
| 15.00 | 253.0 | 242.7 | 253.6 |
| 16.00 | 222.9 | 216.8 | 226.0 |
| 17.00 | 201.3 | 196.0 | 204.1 |
| 18.00 | 180.1 | 174.9 | 181.1 |
| 19.00 | 163.3 | 161.0 | 161.8 |
| 20.00 | 150.6 | 148.4 | 146.8 |

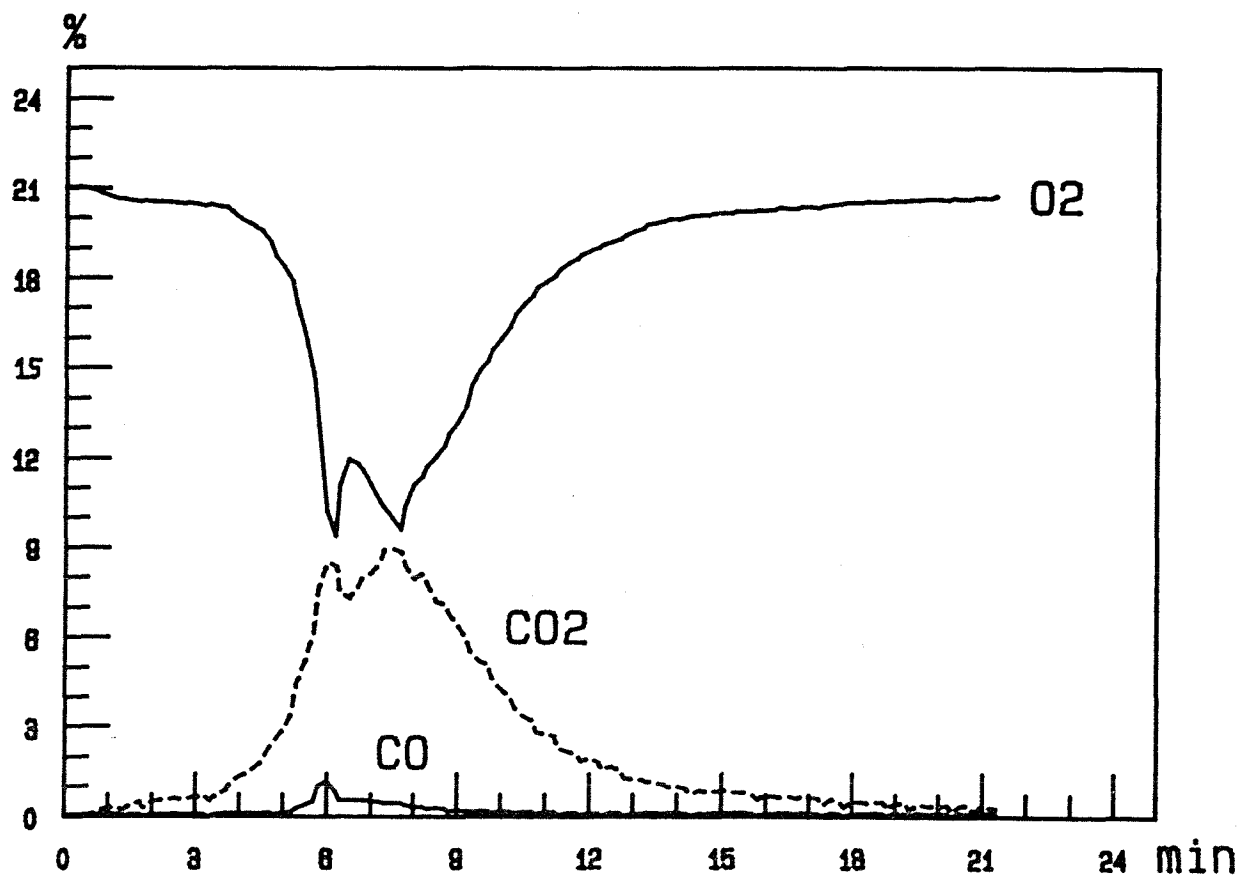
Temperaturen der Meßstellen 28 bis 30 bei Versuch 45.3



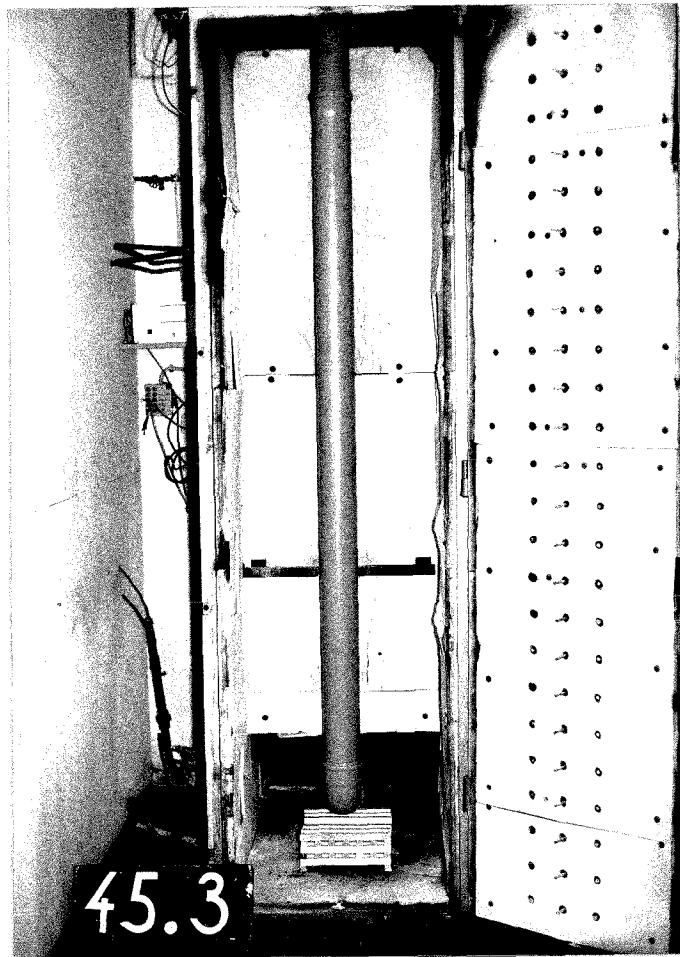
Temperatur und Flammenhoehe bei Versuch 45.3



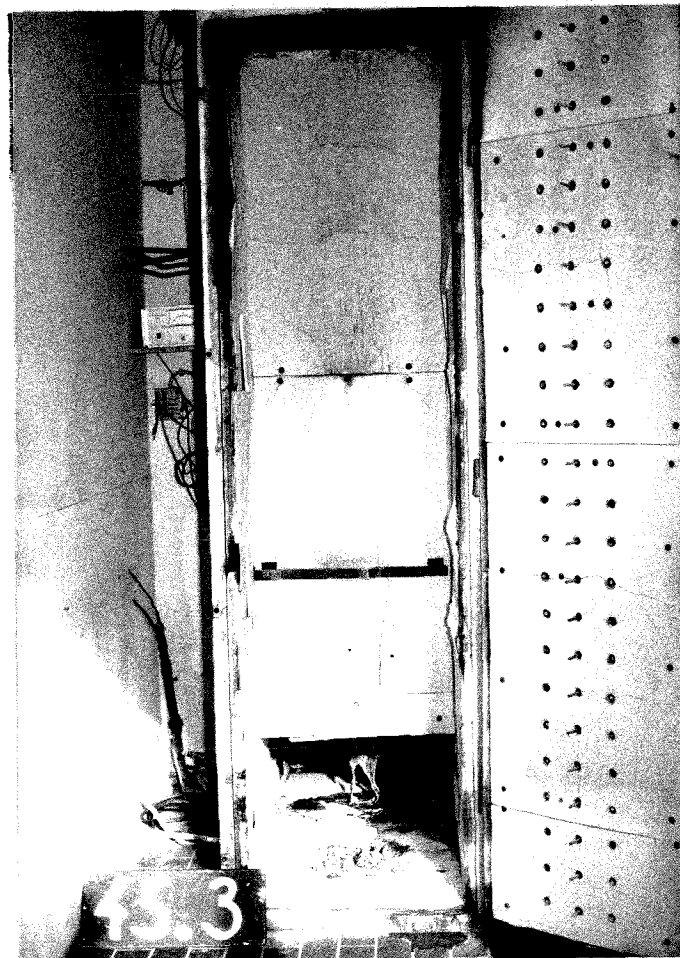
Druckverlauf im Brandraum bei Versuch 45.3



CO₂, CO, O₂-Gehalt bei Versuch 45.3



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 45.4

Materialbeschreibung

Material Nr. 10 : 1 Abwasserrohr
aus Polypropylen

Abmessungen

Innendurchmesser/Außendurchmesser: 103,5 mm/109,5 mm
Zwischenraum zwischen den Proben : -

Beobachtungen während des Brandversuches Nr. 45.4 am 06.10.1987

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung des Gasbrenners. |
| 0' 35" | Abtropfen des Materials im Kniebereich. |
| 2' | Rohr-Kniestück brennt. |
| 2' 20" | Kniestück durchgebrannt. |
| 3' | Brennendes Abtropfen. |
| 4' | Abgefallenes Kniestück brennt weiter. |
| 7' | Rohr brennt in voller Länge. |
| 10' | Flammenhöhe von 160 cm erreicht. |
| 20' | Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0

Das eingesetzte Versuchsmaterial ist vollständig verbrannt.

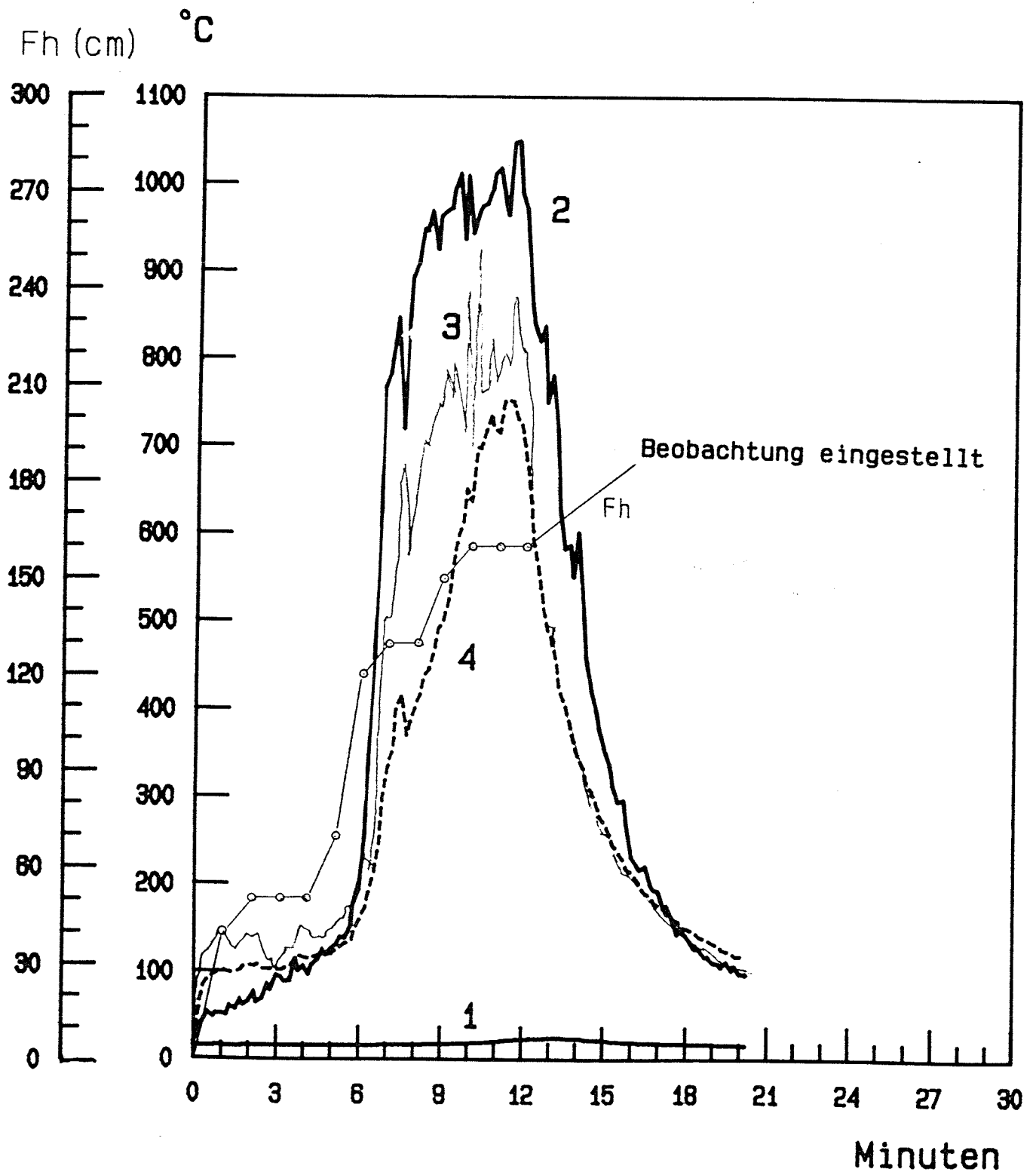
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 14.9 | 18.2 | 19.0 | 18.1 | 18.8 | 19.0 | 25.8 | 34.4 | 42.3 | 36.8 | 35.7 | 31.7 | 29.4 | 26.4 |
| 1.00 | 15.3 | 101.1 | 75.3 | 103.5 | 48.1 | 51.5 | 77.5 | 119.1 | 160.4 | 193.3 | 188.8 | 171.9 | 165.6 | 158.1 |
| 2.00 | 15.5 | 108.2 | 123.1 | 107.8 | 59.0 | 65.4 | 88.1 | 119.2 | 138.9 | 154.6 | 152.0 | 149.5 | 142.3 | 138.6 |
| 3.00 | 15.6 | 106.9 | 82.8 | 96.5 | 74.7 | 95.7 | 156.3 | 158.5 | 150.4 | 135.2 | 121.4 | 114.3 | 107.4 | 105.8 |
| 4.00 | 15.8 | 122.7 | 86.5 | 106.8 | 92.4 | 106.0 | 154.7 | 185.3 | 212.2 | 233.9 | 203.6 | 176.9 | 165.3 | 155.5 |
| 5.00 | 15.8 | 128.0 | 101.9 | 118.5 | 110.6 | 125.7 | 149.8 | 175.7 | 174.6 | 176.3 | 166.9 | 159.6 | 157.3 | 156.0 |
| 6.00 | 15.8 | 158.8 | 145.0 | 163.8 | 161.4 | 194.1 | 190.1 | 205.2 | 230.8 | 237.4 | 221.2 | 215.5 | 213.3 | 208.9 |
| 7.00 | 16.2 | 344.1 | 367.2 | 325.5 | 702.0 | 782.5 | 776.8 | 709.9 | 709.7 | 675.2 | 624.0 | 558.0 | 559.6 | 537.6 |
| 8.00 | 16.5 | 401.6 | 478.9 | 457.1 | 852.1 | 910.0 | 910.7 | 883.7 | 873.1 | 858.8 | 815.2 | 767.3 | 743.9 | 699.2 |
| 9.00 | 17.2 | 502.6 | 538.2 | 619.1 | 894.8 | 968.5 | 995.1 | 988.1 | 962.7 | 934.8 | 899.9 | 867.2 | 844.1 | 817.7 |
| 10.00 | 18.3 | 722.1 | 609.7 | 723.7 | 938.8 | 943.1 | 875.6 | 817.2 | 732.1 | 711.4 | 690.5 | 686.7 | 678.8 | 702.6 |
| 11.00 | 20.6 | 802.9 | 622.0 | 800.8 | 972.0 | 1018.1 | 942.2 | 866.3 | 808.8 | 796.7 | 787.4 | 783.6 | 782.2 | 789.1 |
| 12.00 | 23.2 | 752.8 | 675.0 | 763.7 | 935.7 | 972.5 | 931.6 | 870.1 | 834.0 | 800.4 | 780.3 | 782.7 | 803.9 | 807.9 |
| 13.00 | 24.3 | 500.6 | 499.8 | 505.0 | 819.5 | 781.3 | 686.5 | 635.5 | 577.9 | 542.2 | 521.3 | 514.9 | 504.4 | 502.0 |
| 14.00 | 23.9 | 370.4 | 379.7 | 369.4 | 618.1 | 601.4 | 500.0 | 446.3 | 381.4 | 348.5 | 347.0 | 352.1 | 346.4 | 344.7 |
| 15.00 | 21.8 | 283.6 | 311.5 | 293.2 | 417.9 | 356.6 | 283.9 | 289.1 | 243.7 | 230.2 | 237.6 | 251.6 | 253.5 | 258.8 |
| 16.00 | 19.8 | 228.4 | 258.7 | 227.0 | 295.6 | 231.3 | 181.5 | 205.4 | 172.9 | 168.9 | 175.6 | 191.1 | 197.8 | 203.1 |
| 17.00 | 18.5 | 189.3 | 218.0 | 193.0 | 232.3 | 191.9 | 156.7 | 171.2 | 145.6 | 141.5 | 146.4 | 156.2 | 160.5 | 163.0 |
| 18.00 | 17.8 | 161.4 | 187.2 | 161.9 | 183.2 | 142.6 | 114.7 | 130.8 | 113.8 | 112.3 | 117.6 | 125.6 | 131.5 | 135.6 |
| 19.00 | 17.0 | 140.2 | 151.0 | 140.9 | 143.5 | 111.0 | 89.3 | 105.9 | 94.7 | 96.0 | 103.0 | 110.2 | 116.2 | 117.4 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 27.5 | 25.1 | 23.8 | 21.5 | 21.6 | 20.0 | 19.0 | 18.4 | 18.2 | 18.4 | 18.3 | 18.3 | 18.5 |
| 1.00 | 148.3 | 142.7 | 132.6 | 124.5 | 118.0 | 120.7 | 116.9 | 114.3 | 112.5 | 103.3 | 110.1 | 111.2 | 102.4 |
| 2.00 | 135.5 | 135.0 | 131.9 | 129.0 | 125.9 | 126.9 | 122.7 | 120.5 | 120.3 | 113.7 | 117.2 | 115.9 | 108.5 |
| 3.00 | 103.4 | 101.3 | 100.9 | 99.8 | 99.6 | 100.7 | 99.5 | 97.4 | 97.1 | 96.0 | 96.6 | 98.0 | 93.3 |
| 4.00 | 147.9 | 143.9 | 138.4 | 131.1 | 128.3 | 128.5 | 123.7 | 121.8 | 121.3 | 116.6 | 119.1 | 120.7 | 114.4 |
| 5.00 | 148.5 | 145.4 | 141.5 | 135.0 | 132.3 | 132.9 | 128.7 | 126.5 | 126.2 | 121.1 | 123.4 | 124.9 | 119.2 |
| 6.00 | 203.4 | 195.2 | 185.8 | 179.2 | 175.7 | 178.2 | 172.1 | 169.9 | 166.8 | 155.6 | 162.9 | 163.7 | 154.6 |
| 7.00 | 502.9 | 473.1 | 444.5 | 409.9 | 399.0 | 395.4 | 371.5 | 362.6 | 358.1 | 333.9 | 354.0 | 354.7 | 336.8 |
| 8.00 | 662.1 | 623.6 | 594.6 | 564.2 | 538.2 | 530.1 | 506.7 | 487.0 | 478.5 | 454.2 | 458.9 | 453.0 | 427.4 |
| 9.00 | 792.5 | 763.7 | 742.3 | 721.4 | 701.0 | 683.8 | 656.4 | 637.0 | 623.8 | 590.6 | 582.5 | 572.0 | 537.9 |
| 10.00 | 694.7 | 692.3 | 702.6 | 705.8 | 714.4 | 706.6 | 708.8 | 711.5 | 713.6 | 710.9 | 702.4 | 697.0 | 679.9 |
| 11.00 | 787.5 | 787.5 | 795.9 | 796.4 | 805.8 | 798.9 | 799.1 | 801.4 | 805.2 | 801.9 | 790.9 | 788.5 | 768.6 |
| 12.00 | 805.0 | 803.7 | 811.3 | 807.5 | 810.3 | 798.0 | 789.2 | 782.9 | 781.3 | 779.2 | 764.7 | 760.9 | 745.6 |
| 13.00 | 498.4 | 489.0 | 496.2 | 497.4 | 501.6 | 488.6 | 493.2 | 495.1 | 494.6 | 507.4 | 493.5 | 491.6 | 500.1 |
| 14.00 | 345.3 | 336.3 | 345.5 | 349.0 | 351.8 | 340.2 | 350.0 | 350.4 | 354.0 | 369.8 | 353.0 | 350.3 | 362.1 |
| 15.00 | 261.7 | 252.1 | 264.0 | 271.7 | 278.6 | 265.7 | 275.8 | 275.3 | 279.3 | 295.4 | 278.2 | 274.9 | 288.1 |
| 16.00 | 207.6 | 200.7 | 214.7 | 218.4 | 226.3 | 215.3 | 223.2 | 222.7 | 226.7 | 240.8 | 225.5 | 219.4 | 227.0 |
| 17.00 | 168.3 | 161.1 | 172.7 | 178.1 | 187.3 | 175.2 | 182.8 | 182.1 | 185.4 | 197.9 | 184.7 | 181.3 | 191.5 |
| 18.00 | 141.2 | 135.4 | 145.2 | 150.1 | 158.0 | 148.5 | 155.0 | 154.5 | 157.4 | 168.5 | 157.7 | 154.1 | 162.0 |
| 19.00 | 122.6 | 117.3 | 125.8 | 130.1 | 137.1 | 128.8 | 134.6 | 134.9 | 137.4 | 147.4 | 137.9 | 136.4 | 143.2 |

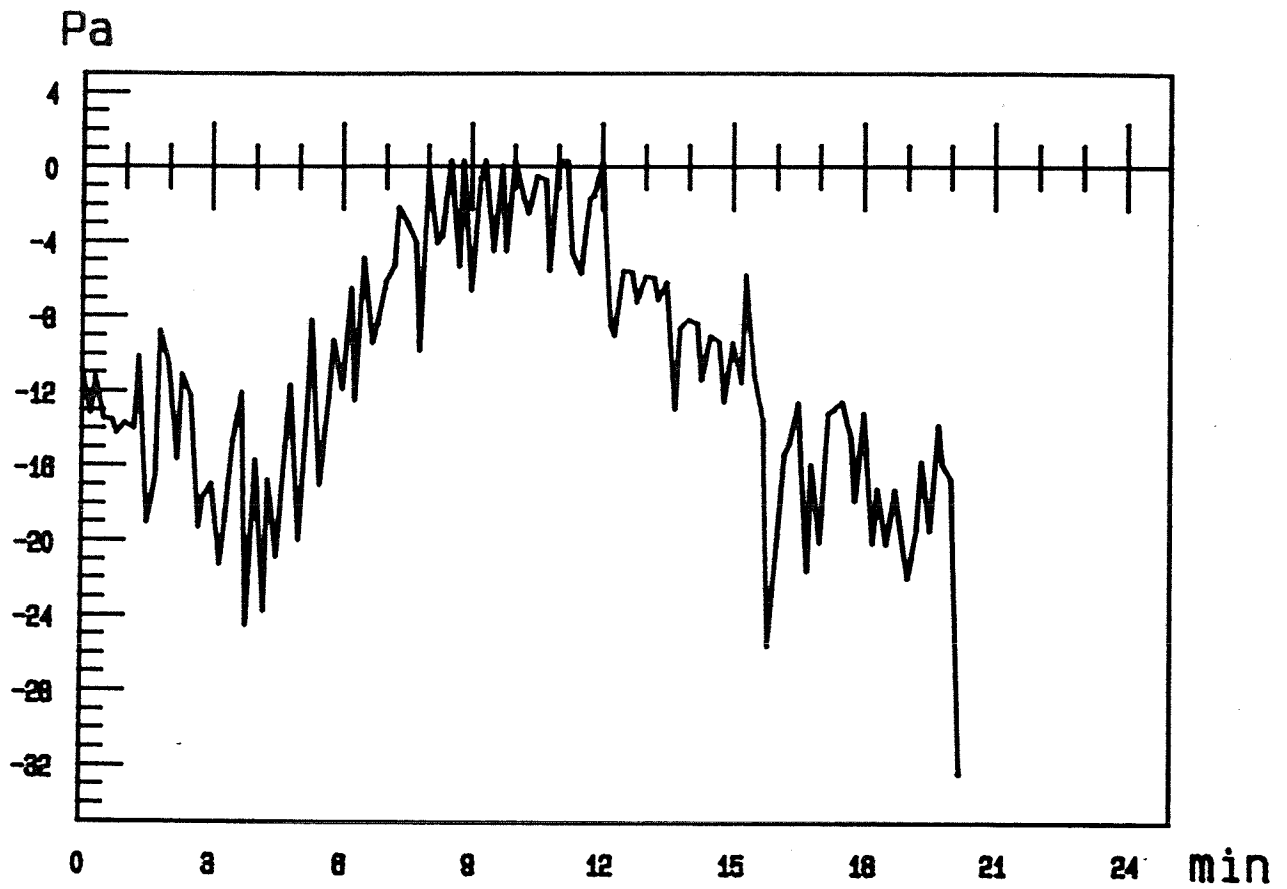
Temperaturen der Meßstellen 1 bis 27 bei Versuch 45.4

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 18.5 | 18.2 | 18.4 |
| 1.00 | 104.2 | 105.6 | 99.3 |
| 2.00 | 110.5 | 110.7 | 102.4 |
| 3.00 | 95.9 | 118.4 | 93.7 |
| 4.00 | 116.5 | 123.0 | 108.7 |
| 5.00 | 120.4 | 128.6 | 111.7 |
| 6.00 | 159.2 | 165.3 | 154.7 |
| 7.00 | 347.0 | 351.8 | 298.1 |
| 8.00 | 424.2 | 410.2 | 378.9 |
| 9.00 | 533.6 | 512.9 | 458.4 |
| 10.00 | 677.3 | 680.6 | 553.8 |
| 11.00 | 763.5 | 730.8 | 652.0 |
| 12.00 | 736.3 | 713.1 | 639.5 |
| 13.00 | 489.0 | 481.6 | 458.9 |
| 14.00 | 351.0 | 346.2 | 341.5 |
| 15.00 | 278.5 | 267.1 | 264.5 |
| 16.00 | 218.3 | 208.7 | 210.2 |
| 17.00 | 183.8 | 171.8 | 174.4 |
| 18.00 | 155.6 | 146.0 | 149.8 |
| 19.00 | 138.6 | 128.0 | 133.2 |

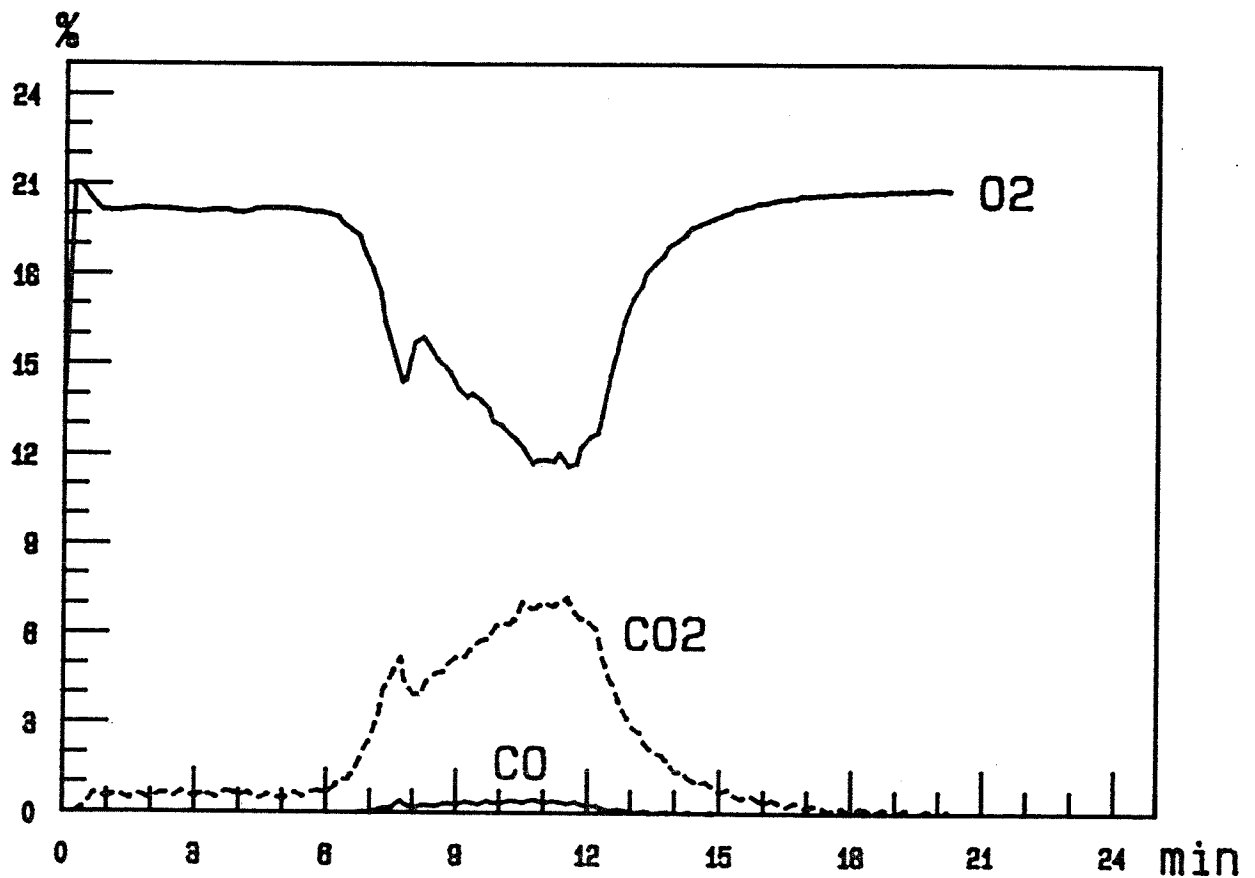
Temperaturen der Meßstellen 28 bis 30 bei Versuch 45.4



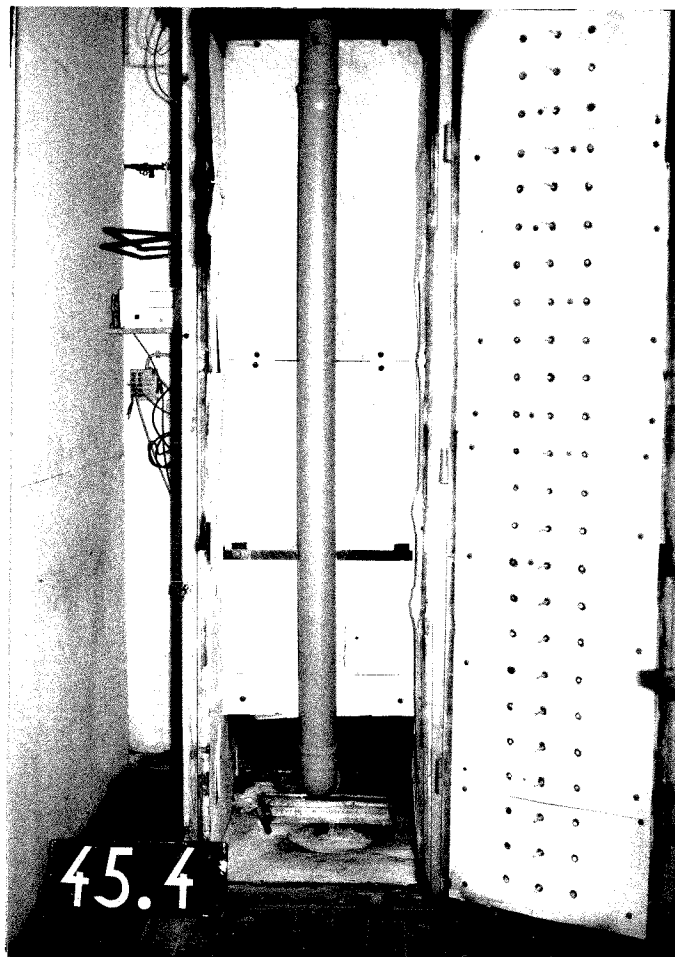
Temperatur und Flammenhoehe bei Versuch 45.4



Druckverlauf im Brandraum bei Versuch 45.4



CO₂, CO, O₂-Gehalt bei Versuch 45.4



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 45.5

Materialbeschreibung

Material Nr. 10 : 1 Abwasserrohr
aus Polypropylen

Abmessungen

Innendurchmesser/Außendurchmesser: 103,5 mm/109,5 mm
Zwischenraum zwischen den Proben : -

Beobachtungen während des Brandversuches Nr. 45.5 am 16.10.1987

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|--|
| 0' | Zündung des Gasbrenners. |
| 0' 40" | Material tropft im Kniebereich brennend ab. |
| 1' 45" | Material verformt sich weiter, tropft brennend ab und brennt auf dem Boden weiter. |
| 2' 15" | Knie reißt auf, tropft brennend auf den Boden und brennt dort weiter. |
| 4' 30" | Rohr und Knie haben sich vollkommen voneinander gelöst. |
| 7' 15" | Flammenhöhe durch herabtropfen- des Material über 1,60 m. |
| 8' 30" | Rohr voll in Flammen. Reste des Rohres fallen von der Aufhängung ab und brennen auf dem Bo- den mit. |
| 10'-20' | Material brennt auch nach 10 Min. nach dem Abschalten der Gaszufuhr weiter. Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0 mm

Das eingesetzte Versuchsmaterial ist vollständig verbrannt.

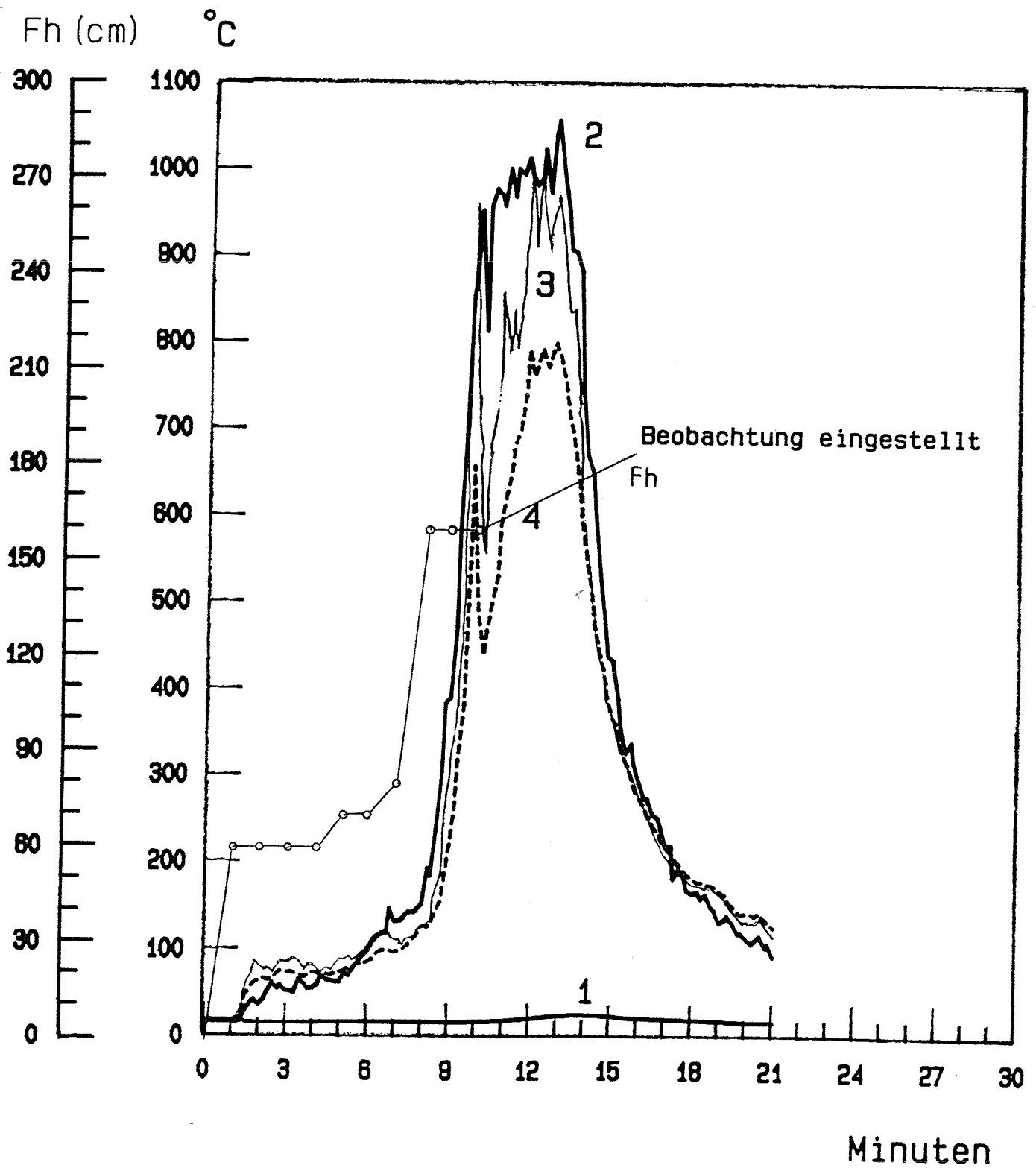
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 15.7 | 17.8 | 18.2 | 17.8 | 17.5 | 17.2 | 16.9 | 16.9 | 16.8 | 16.9 | 16.9 | 17.0 | 17.1 | 17.1 |
| 1.00 | 15.8 | 17.9 | 18.2 | 17.9 | 17.7 | 17.3 | 17.0 | 17.1 | 17.0 | 17.0 | 17.1 | 17.2 | 17.2 | 17.3 |
| 2.00 | 15.9 | 63.4 | 60.9 | 64.2 | 33.8 | 36.3 | 45.7 | 59.0 | 87.3 | 101.8 | 94.5 | 85.4 | 84.0 | 84.0 |
| 3.00 | 15.9 | 75.7 | 59.4 | 77.5 | 49.2 | 52.7 | 78.0 | 93.8 | 110.2 | 99.2 | 93.5 | 90.3 | 91.5 | 89.2 |
| 4.00 | 16.0 | 78.2 | 65.9 | 74.6 | 53.9 | 55.7 | 64.2 | 89.1 | 108.7 | 98.6 | 92.7 | 90.5 | 87.7 | 85.3 |
| 5.00 | 16.1 | 74.6 | 58.3 | 68.9 | 60.8 | 62.8 | 68.2 | 79.6 | 87.6 | 95.3 | 92.7 | 90.6 | 91.6 | 91.4 |
| 6.00 | 16.4 | 87.5 | 72.9 | 85.4 | 95.0 | 100.5 | 118.5 | 126.8 | 123.5 | 121.1 | 112.4 | 105.0 | 103.2 | 97.7 |
| 7.00 | 16.3 | 99.9 | 81.8 | 93.4 | 137.7 | 133.4 | 138.9 | 136.8 | 135.7 | 135.1 | 124.6 | 117.1 | 118.2 | 120.0 |
| 8.00 | 16.5 | 126.8 | 111.9 | 134.2 | 156.1 | 154.1 | 155.3 | 157.4 | 154.8 | 149.5 | 138.9 | 131.7 | 133.0 | 133.2 |
| 9.00 | 16.7 | 202.1 | 178.9 | 195.7 | 368.5 | 391.6 | 421.8 | 378.2 | 372.5 | 386.8 | 362.0 | 327.3 | 339.5 | 335.4 |
| 10.00 | 17.0 | 515.0 | 534.4 | 581.4 | 741.4 | 953.7 | 901.4 | 816.6 | 756.8 | 727.1 | 691.0 | 682.6 | 654.5 | 685.5 |
| 11.00 | 18.5 | 636.5 | 629.5 | 801.9 | 836.8 | 1002.2 | 985.9 | 896.7 | 832.3 | 815.7 | 801.4 | 788.2 | 783.8 | 801.2 |
| 12.00 | 20.7 | 782.0 | 718.2 | 886.2 | 917.3 | 984.4 | 967.7 | 921.0 | 890.6 | 885.0 | 886.9 | 895.2 | 901.1 | 921.4 |
| 13.00 | 23.5 | 802.4 | 726.6 | 896.0 | 968.0 | 998.8 | 958.1 | 931.5 | 902.2 | 901.1 | 904.9 | 908.1 | 913.4 | 926.8 |
| 14.00 | 24.6 | 580.2 | 606.5 | 622.6 | 777.8 | 671.9 | 602.1 | 599.6 | 535.3 | 526.9 | 534.9 | 557.9 | 557.5 | 573.5 |
| 15.00 | 23.6 | 391.6 | 412.8 | 398.1 | 496.8 | 434.4 | 388.9 | 398.6 | 349.3 | 338.6 | 346.2 | 364.1 | 359.9 | 366.2 |
| 16.00 | 21.6 | 294.9 | 330.9 | 305.3 | 370.5 | 293.3 | 261.6 | 279.6 | 239.9 | 231.1 | 244.3 | 263.6 | 260.6 | 270.3 |
| 17.00 | 20.3 | 234.2 | 270.3 | 245.1 | 278.6 | 221.4 | 189.0 | 212.2 | 189.6 | 187.9 | 196.4 | 209.5 | 209.2 | 211.6 |
| 18.00 | 19.0 | 196.2 | 220.3 | 204.6 | 219.5 | 166.9 | 147.3 | 164.8 | 147.4 | 148.6 | 157.6 | 169.5 | 168.8 | 173.4 |
| 19.00 | 18.1 | 181.2 | 183.7 | 183.7 | 174.4 | 133.3 | 119.4 | 144.2 | 135.0 | 137.2 | 146.5 | 158.8 | 159.4 | 164.1 |
| 20.00 | 16.7 | 152.2 | 155.3 | 152.8 | 160.8 | 115.4 | 97.7 | 114.2 | 104.6 | 103.9 | 111.3 | 122.4 | 125.5 | 130.9 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 17.2 | 17.2 | 17.3 | 17.4 | 17.6 | 17.5 | 17.6 | 17.7 | 17.6 | 17.8 | 17.7 | 17.7 | 18.0 |
| 1.00 | 17.4 | 17.4 | 17.5 | 17.6 | 17.7 | 17.7 | 17.7 | 17.8 | 17.7 | 17.9 | 17.8 | 17.8 | 18.0 |
| 2.00 | 80.7 | 83.7 | 78.9 | 75.1 | 72.9 | 77.3 | 73.3 | 74.3 | 72.6 | 66.2 | 69.9 | 70.2 | 63.5 |
| 3.00 | 86.1 | 87.9 | 85.9 | 83.1 | 80.7 | 82.3 | 77.5 | 75.8 | 75.4 | 72.6 | 75.0 | 76.2 | 70.8 |
| 4.00 | 83.9 | 84.5 | 83.4 | 81.8 | 80.1 | 81.3 | 79.5 | 79.0 | 78.6 | 74.4 | 76.2 | 75.9 | 71.6 |
| 5.00 | 89.5 | 87.9 | 86.6 | 84.7 | 83.0 | 82.4 | 79.9 | 79.2 | 78.5 | 75.8 | 76.9 | 77.7 | 74.2 |
| 6.00 | 95.1 | 95.0 | 94.7 | 92.2 | 91.3 | 93.1 | 91.3 | 90.6 | 90.2 | 86.1 | 88.6 | 88.5 | 83.2 |
| 7.00 | 110.9 | 109.4 | 106.5 | 103.7 | 101.1 | 102.6 | 100.7 | 101.2 | 102.5 | 99.1 | 100.9 | 100.7 | 96.0 |
| 8.00 | 128.4 | 130.3 | 132.6 | 131.0 | 130.5 | 136.5 | 133.5 | 134.7 | 133.6 | 125.3 | 131.9 | 132.0 | 122.9 |
| 9.00 | 301.4 | 295.5 | 282.2 | 254.0 | 240.9 | 248.5 | 236.2 | 238.4 | 236.1 | 219.5 | 234.8 | 238.1 | 215.9 |
| 10.00 | 654.1 | 651.9 | 646.6 | 631.3 | 617.9 | 610.2 | 608.0 | 590.8 | 593.6 | 585.0 | 564.9 | 555.6 | 520.1 |
| 11.00 | 785.4 | 784.5 | 789.7 | 779.2 | 769.8 | 769.5 | 760.8 | 751.1 | 750.7 | 727.7 | 724.3 | 713.9 | 675.3 |
| 12.00 | 907.0 | 904.7 | 908.2 | 905.9 | 904.7 | 899.2 | 896.3 | 890.0 | 885.5 | 876.3 | 866.7 | 860.1 | 834.4 |
| 13.00 | 924.0 | 921.0 | 925.0 | 924.2 | 918.1 | 910.9 | 902.8 | 895.9 | 893.8 | 885.9 | 877.4 | 870.7 | 848.5 |
| 14.00 | 567.4 | 563.4 | 568.3 | 575.7 | 584.5 | 566.3 | 579.1 | 576.3 | 580.1 | 596.5 | 575.1 | 573.2 | 578.9 |
| 15.00 | 368.0 | 358.7 | 370.0 | 377.7 | 387.1 | 369.5 | 385.6 | 383.8 | 385.9 | 405.3 | 382.8 | 378.4 | 391.5 |
| 16.00 | 274.5 | 265.7 | 277.4 | 284.2 | 290.9 | 273.9 | 285.4 | 282.0 | 282.6 | 300.2 | 279.9 | 278.1 | 292.3 |
| 17.00 | 215.8 | 208.7 | 218.7 | 225.9 | 235.6 | 220.5 | 229.1 | 226.9 | 226.9 | 243.6 | 226.5 | 223.5 | 236.7 |
| 18.00 | 175.4 | 169.2 | 178.8 | 185.7 | 194.3 | 180.4 | 187.6 | 187.0 | 189.0 | 204.3 | 188.6 | 185.3 | 196.8 |
| 19.00 | 167.4 | 161.1 | 169.7 | 174.6 | 182.8 | 172.3 | 175.8 | 175.3 | 177.1 | 188.0 | 175.7 | 172.8 | 180.1 |
| 20.00 | 136.0 | 130.7 | 139.6 | 145.2 | 153.5 | 142.5 | 147.8 | 147.3 | 148.4 | 158.5 | 147.5 | 145.5 | 153.3 |

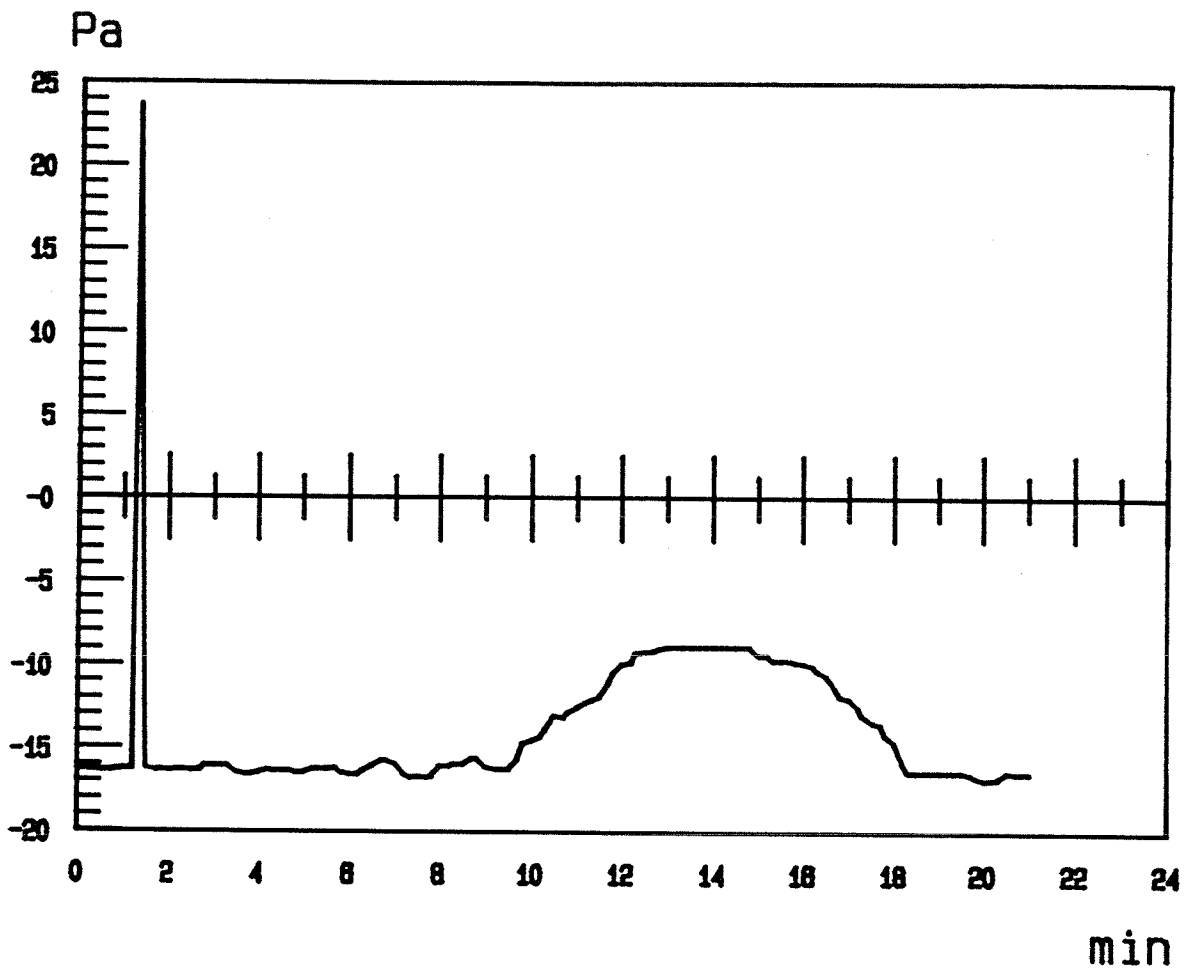
Temperaturen der Meßstellen 1 bis 27 bei Versuch 45.5

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 17.9 | 17.8 | 18.1 |
| 1.00 | 18.0 | 17.9 | 18.2 |
| 2.00 | 67.1 | 66.4 | 60.9 |
| 3.00 | 73.7 | 74.3 | 69.8 |
| 4.00 | 74.1 | 78.1 | 69.5 |
| 5.00 | 75.4 | 79.4 | 67.6 |
| 6.00 | 86.0 | 90.7 | 80.5 |
| 7.00 | 98.3 | 99.4 | 94.7 |
| 8.00 | 125.1 | 130.9 | 125.2 |
| 9.00 | 227.9 | 223.7 | 197.7 |
| 10.00 | 522.1 | 504.6 | 443.4 |
| 11.00 | 675.1 | 643.9 | 560.0 |
| 12.00 | 824.7 | 769.5 | 693.2 |
| 13.00 | 836.3 | 782.8 | 724.6 |
| 14.00 | 568.2 | 554.1 | 536.1 |
| 15.00 | 378.9 | 368.0 | 368.9 |
| 16.00 | 281.0 | 271.9 | 277.1 |
| 17.00 | 226.2 | 213.0 | 220.6 |
| 18.00 | 187.5 | 178.2 | 186.1 |
| 19.00 | 173.8 | 166.3 | 172.8 |
| 20.00 | 147.1 | 139.1 | 145.0 |

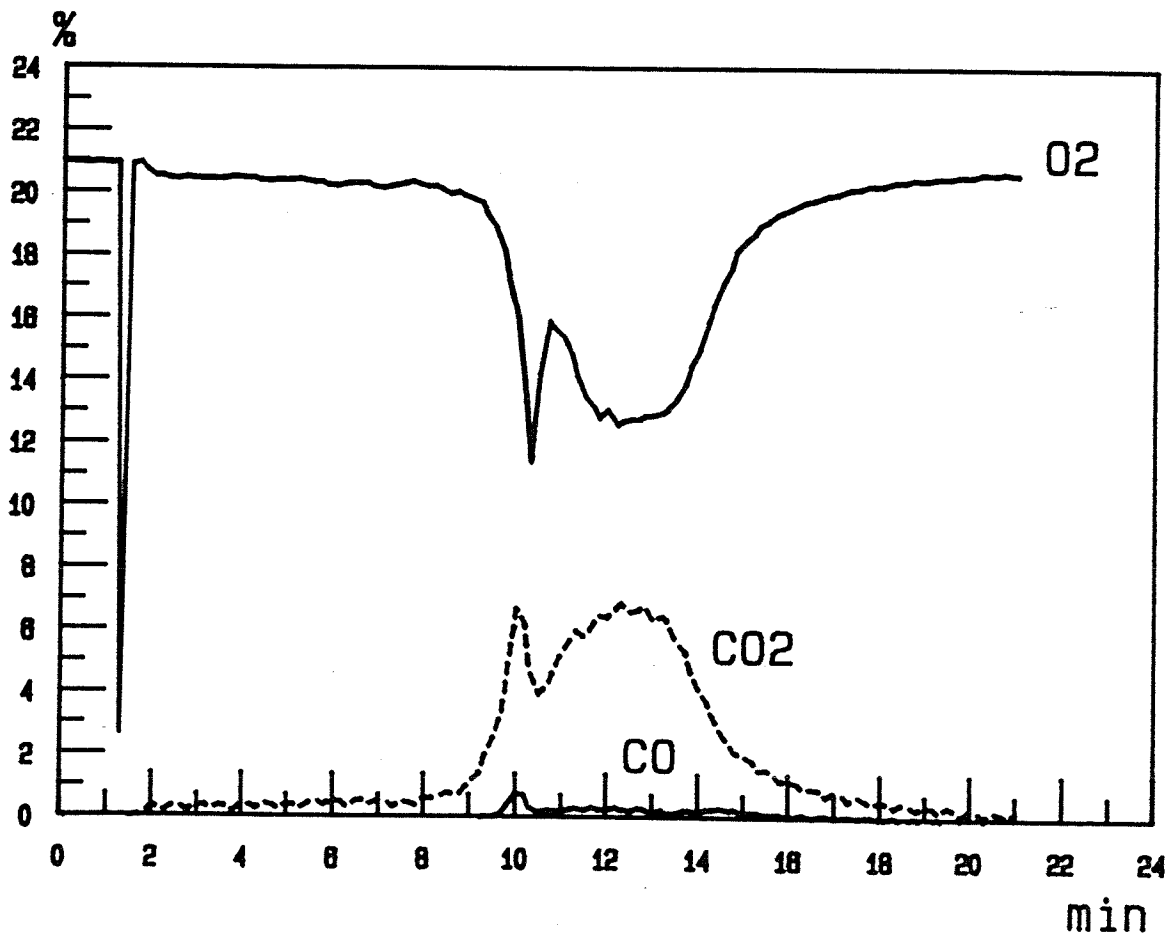
Temperaturen der Meßstellen 28 bis 30 bei Versuch 45.5



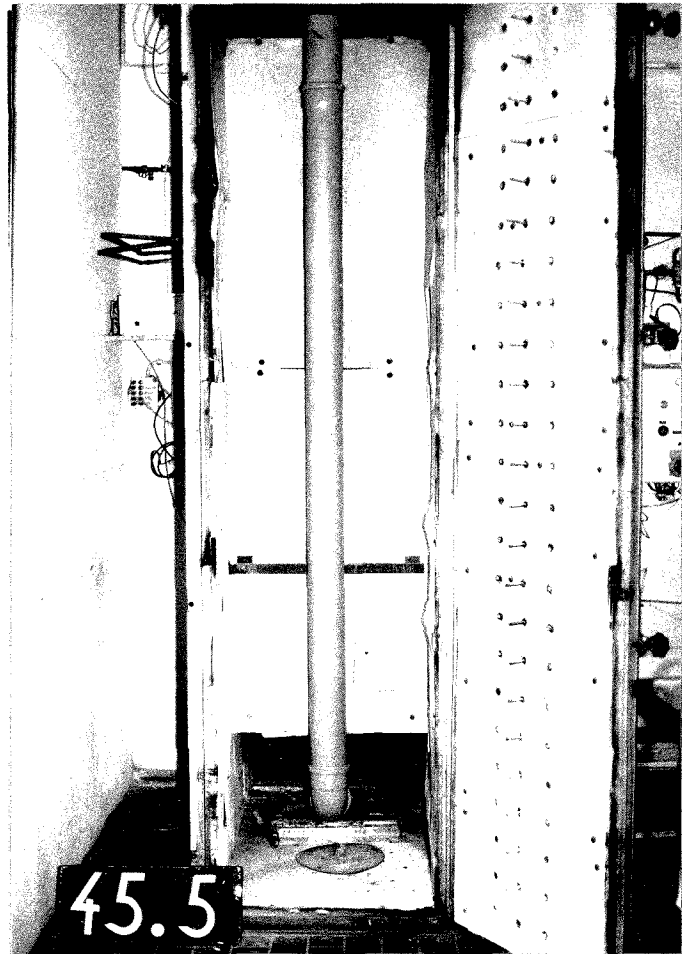
Temperatur und Flammenhoehe bei Versuch 45.5



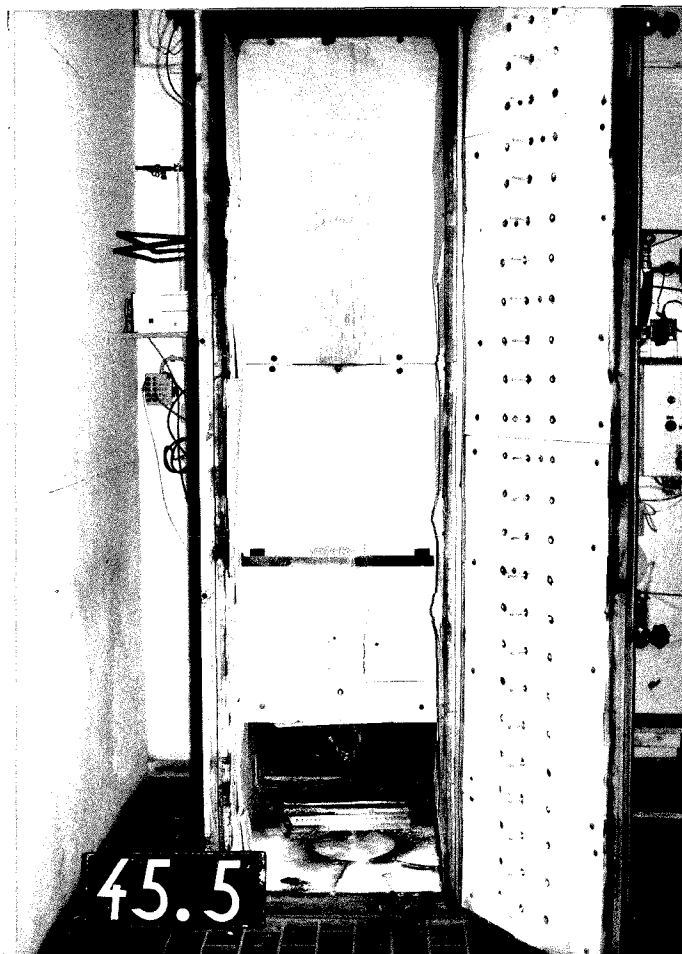
Druckverlauf im Brandraum bei Versuch 45.5



CO₂, CO, O₂-Gehalt bei Versuch 45.5



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 45.6

Materialbeschreibung

Material Nr. 10 : 1 Abwasserrohr
aus Polypropylen

Abmessungen

Innendurchmesser/Außendurchmesser: 103,5 mm/109,5 mm
Zwischenraum zwischen den Proben : -

Beobachtungen während des Brandversuches Nr. 45.6 am 19.10.1987

| Zeit nach Versuchsbeginn | | Beobachtungen |
|-----------------------------|-----|---|
| 0' | | Zündung des Gasbrenners. |
| 0' | 50" | Material tropft hinter dem Knie an der Nahtstelle brennend ab. |
| 1' | 45" | Material über dem Brenner aufgerissen. |
| 2' | 15" | Knie zerstört, Material tropft brennend ab und brennt auf dem Boden weiter. |
| 3' | 15" | Knie vom oberen Teil des Rohres abgefallen und verbrennt auf dem Boden. Restrohr verformt sich. |
| 5' | 30" | Herunterhängendes Restmaterial brennt ab und verstärkt das Brandgeschehen. |
| 6' | 30" | Flammenhöhe nimmt schnell zu, über 160 cm Flammenhöhe. |
| 8' | 15" | Restrohr ist aus der Halterung herabgefallen und brennt auf dem Boden weiter. |
| 10' | | Versuchsende. Gas- und Luftzufuhr abgestellt. |

Beobachtungen nach dem Versuch

Restlänge: 0 mm

Das eingesetzte Versuchsmaterial ist vollständig verbrannt.

| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 18.3 | 31.5 | 43.5 | 38.3 | 27.5 | 36.6 | 58.9 | 48.7 | 54.3 | 55.2 | 51.1 | 45.1 | 48.7 | 45.1 |
| 1.00 | 18.1 | 62.8 | 54.6 | 62.3 | 41.3 | 49.8 | 70.0 | 79.6 | 86.6 | 86.1 | 80.6 | 77.3 | 75.4 | 75.6 |
| 2.00 | 18.5 | 84.3 | 76.1 | 86.7 | 52.0 | 59.7 | 82.0 | 99.5 | 101.9 | 107.1 | 101.4 | 94.5 | 89.7 | 93.1 |
| 3.00 | 18.0 | 74.3 | 69.2 | 72.8 | 63.3 | 73.4 | 88.5 | 88.6 | 95.8 | 94.7 | 94.3 | 89.5 | 88.0 | 83.9 |
| 4.00 | 18.1 | 111.6 | 152.6 | 127.4 | 87.0 | 99.6 | 126.2 | 135.4 | 144.0 | 149.8 | 144.1 | 135.8 | 136.5 | 135.9 |
| 5.00 | 18.2 | 104.8 | 107.2 | 99.6 | 102.6 | 100.8 | 112.9 | 134.4 | 155.2 | 150.4 | 133.9 | 122.3 | 116.2 | 113.5 |
| 6.00 | 18.3 | 128.2 | 126.7 | 130.5 | 186.1 | 190.4 | 199.6 | 177.0 | 179.0 | 168.2 | 152.1 | 140.8 | 139.9 | 134.9 |
| 7.00 | 18.7 | 206.9 | 195.1 | 191.0 | 485.5 | 498.0 | 495.9 | 422.1 | 400.7 | 363.2 | 313.1 | 267.1 | 257.9 | 247.1 |
| 8.00 | 18.9 | 406.7 | 466.2 | 405.6 | 805.7 | 820.7 | 817.4 | 750.6 | 713.6 | 697.4 | 625.2 | 574.4 | 579.7 | 575.6 |
| 9.00 | 19.5 | 506.7 | 596.7 | 617.5 | 941.6 | 997.1 | 943.7 | 891.5 | 851.4 | 814.4 | 767.3 | 738.3 | 726.4 | 710.7 |
| 10.00 | 20.9 | 670.4 | 732.4 | 869.3 | 891.9 | 1001.0 | 954.7 | 950.0 | 930.1 | 908.2 | 888.3 | 875.6 | 881.1 | 881.6 |
| 11.00 | 22.6 | 699.1 | 735.2 | 861.2 | 960.0 | 970.8 | 877.2 | 834.6 | 788.3 | 752.1 | 737.9 | 729.1 | 721.2 | 745.9 |
| 12.00 | 23.9 | 549.8 | 659.5 | 642.7 | 913.2 | 879.0 | 727.1 | 689.7 | 608.0 | 575.8 | 567.8 | 564.0 | 553.8 | 573.9 |
| 13.00 | 23.2 | 396.7 | 463.1 | 427.7 | 632.4 | 527.4 | 457.7 | 451.7 | 382.8 | 366.2 | 369.1 | 386.2 | 384.8 | 389.3 |
| 14.00 | 22.8 | 296.3 | 346.2 | 308.5 | 434.3 | 323.5 | 276.0 | 300.1 | 261.2 | 255.8 | 267.8 | 285.6 | 286.0 | 290.6 |
| 15.00 | 21.2 | 231.3 | 275.1 | 240.5 | 323.9 | 231.4 | 188.3 | 214.0 | 188.7 | 185.9 | 196.8 | 212.3 | 212.7 | 218.0 |
| 16.00 | 20.9 | 194.9 | 210.0 | 196.2 | 277.4 | 173.5 | 140.9 | 165.0 | 147.7 | 146.8 | 158.2 | 172.4 | 174.7 | 180.2 |
| 17.00 | 20.5 | 168.1 | 168.9 | 169.7 | 210.3 | 140.0 | 113.3 | 134.2 | 119.8 | 121.9 | 132.1 | 144.8 | 147.7 | 152.6 |
| 18.00 | 19.8 | 148.1 | 139.6 | 148.7 | 179.7 | 110.6 | 92.5 | 109.1 | 99.7 | 101.0 | 110.6 | 121.7 | 126.0 | 129.5 |

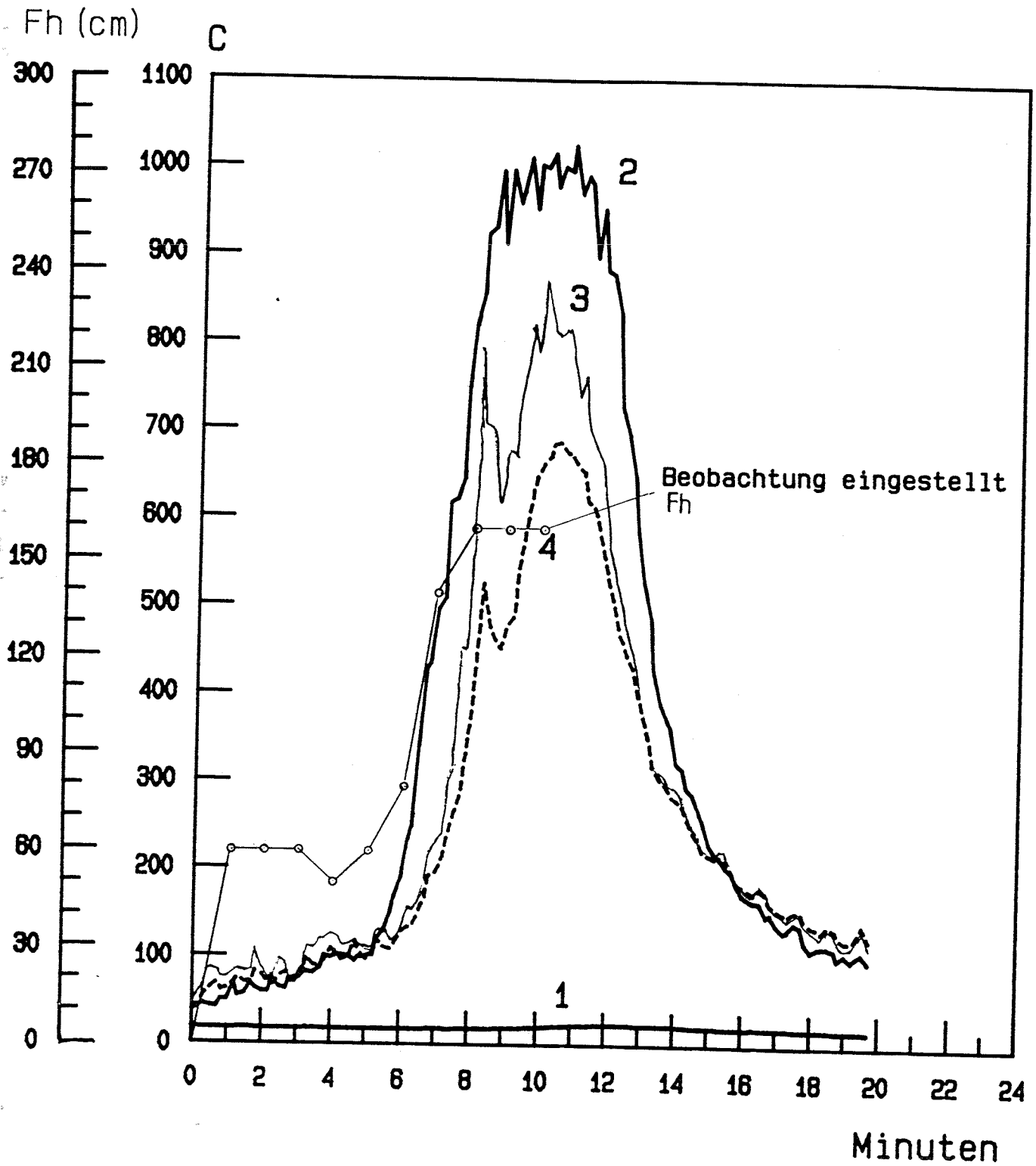
| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 45.0 | 44.1 | 43.0 | 40.6 | 40.2 | 42.8 | 38.7 | 39.9 | 38.6 | 34.9 | 39.9 | 40.0 | 38.6 |
| 1.00 | 73.4 | 76.0 | 73.3 | 70.0 | 66.7 | 67.6 | 65.1 | 65.9 | 65.2 | 62.0 | 63.9 | 64.4 | 60.6 |
| 2.00 | 87.1 | 87.9 | 84.7 | 81.7 | 78.1 | 80.4 | 78.2 | 77.6 | 77.2 | 73.8 | 76.1 | 77.1 | 72.4 |
| 3.00 | 79.5 | 78.4 | 77.5 | 75.7 | 73.9 | 73.8 | 71.4 | 71.3 | 71.3 | 70.0 | 70.9 | 71.4 | 68.8 |
| 4.00 | 127.6 | 128.5 | 122.6 | 118.4 | 115.7 | 121.2 | 114.7 | 115.5 | 114.6 | 104.7 | 111.7 | 109.5 | 102.7 |
| 5.00 | 108.1 | 105.9 | 103.6 | 101.3 | 100.1 | 100.7 | 98.2 | 97.1 | 98.7 | 96.6 | 97.0 | 98.8 | 94.8 |
| 6.00 | 130.6 | 129.1 | 130.2 | 128.1 | 129.3 | 132.6 | 128.2 | 129.6 | 129.6 | 124.9 | 129.9 | 133.2 | 127.4 |
| 7.00 | 233.5 | 229.6 | 222.7 | 215.5 | 210.0 | 215.7 | 204.9 | 207.4 | 206.5 | 197.8 | 209.3 | 207.9 | 192.1 |
| 8.00 | 530.0 | 515.9 | 494.1 | 467.6 | 447.0 | 458.0 | 427.9 | 422.2 | 424.2 | 392.0 | 417.3 | 418.9 | 389.1 |
| 9.00 | 679.0 | 658.0 | 644.5 | 634.4 | 621.5 | 607.4 | 588.4 | 577.5 | 568.8 | 543.9 | 542.8 | 535.8 | 509.0 |
| 10.00 | 872.9 | 867.2 | 860.0 | 849.7 | 837.0 | 827.7 | 811.9 | 800.9 | 790.7 | 767.6 | 762.0 | 752.2 | 722.2 |
| 11.00 | 738.3 | 746.4 | 754.7 | 755.7 | 758.4 | 750.3 | 751.0 | 744.4 | 742.5 | 739.6 | 726.7 | 720.7 | 703.6 |
| 12.00 | 562.3 | 560.4 | 567.8 | 569.6 | 574.5 | 559.2 | 563.9 | 557.4 | 557.5 | 565.8 | 551.4 | 549.7 | 547.7 |
| 13.00 | 383.8 | 375.8 | 383.2 | 389.5 | 396.3 | 381.4 | 395.4 | 391.0 | 393.2 | 409.1 | 390.3 | 386.6 | 394.8 |
| 14.00 | 292.2 | 283.2 | 291.6 | 297.5 | 305.7 | 291.2 | 301.1 | 296.2 | 295.2 | 310.8 | 293.7 | 288.9 | 297.7 |
| 15.00 | 220.0 | 211.8 | 221.0 | 226.3 | 237.5 | 223.2 | 232.1 | 228.8 | 229.7 | 245.1 | 228.2 | 223.6 | 235.1 |
| 16.00 | 182.2 | 174.7 | 183.8 | 190.1 | 202.8 | 186.3 | 195.1 | 191.3 | 192.0 | 205.5 | 193.1 | 188.4 | 196.8 |
| 17.00 | 154.8 | 148.8 | 157.3 | 162.4 | 171.4 | 160.2 | 167.9 | 166.2 | 166.3 | 176.2 | 164.2 | 160.6 | 167.7 |
| 18.00 | 132.9 | 128.7 | 135.2 | 140.1 | 148.9 | 139.5 | 145.4 | 143.4 | 144.3 | 153.7 | 143.3 | 139.7 | 147.4 |

Temperaturen der Meßstellen 1 bis 27 bei Versuch 45.5

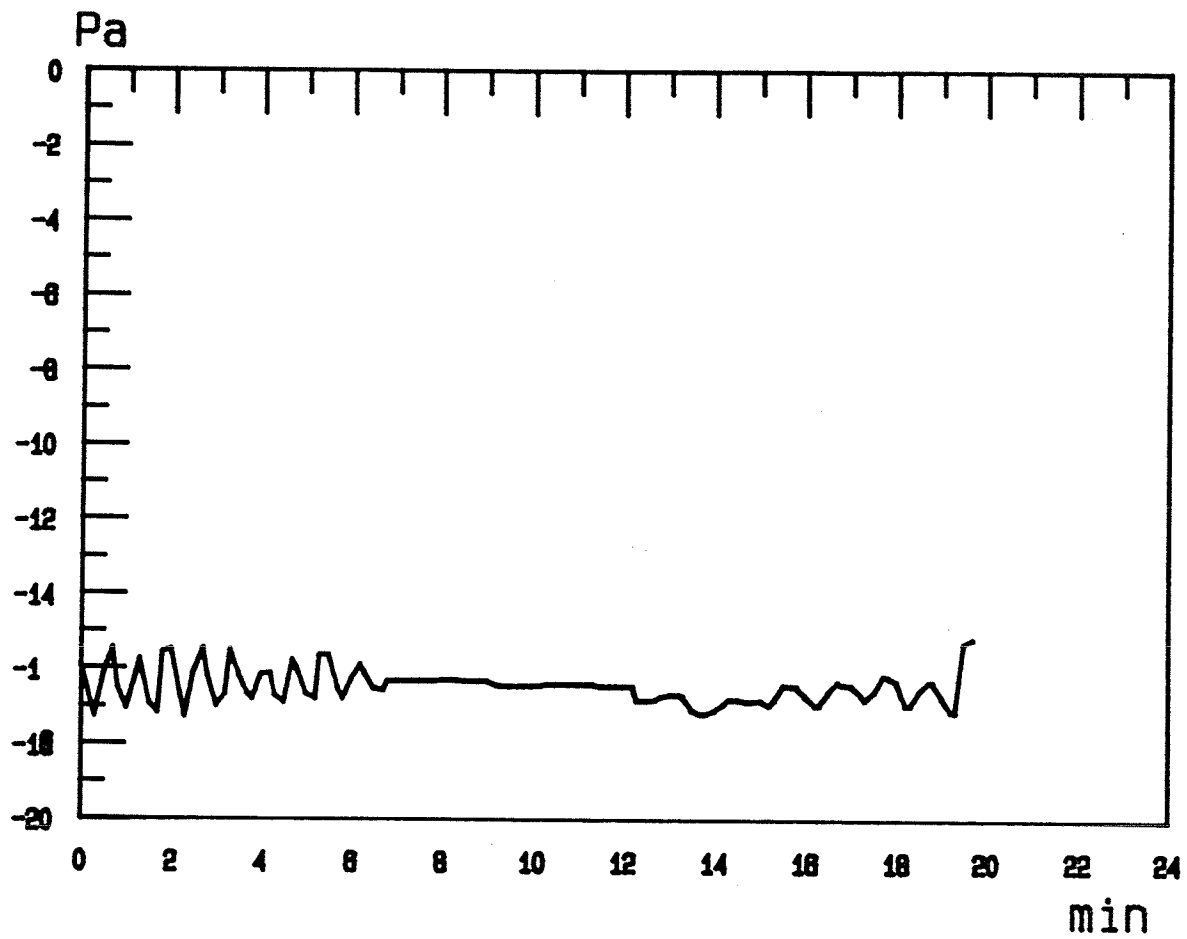
Zeit/Mst 28 29 30
(min)

| | | | |
|-------|-------|-------|-------|
| 0.00 | 38.1 | 38.4 | 30.7 |
| 1.00 | 63.3 | 62.0 | 60.2 |
| 2.00 | 77.4 | 81.7 | 75.5 |
| 3.00 | 70.3 | 76.1 | 65.6 |
| 4.00 | 107.7 | 112.0 | 108.7 |
| 5.00 | 97.4 | 103.8 | 90.7 |
| 6.00 | 128.1 | 130.8 | 124.2 |
| 7.00 | 200.5 | 206.6 | 187.5 |
| 8.00 | 404.6 | 403.8 | 333.7 |
| 9.00 | 508.4 | 496.4 | 434.8 |
| 10.00 | 712.5 | 670.0 | 605.3 |
| 11.00 | 694.9 | 663.0 | 620.8 |
| 12.00 | 539.2 | 524.1 | 504.2 |
| 13.00 | 383.4 | 375.6 | 367.9 |
| 14.00 | 287.4 | 279.4 | 275.7 |
| 15.00 | 224.0 | 213.8 | 213.9 |
| 16.00 | 187.3 | 179.4 | 179.9 |
| 17.00 | 160.6 | 152.4 | 157.2 |
| 18.00 | 141.3 | 135.0 | 139.0 |

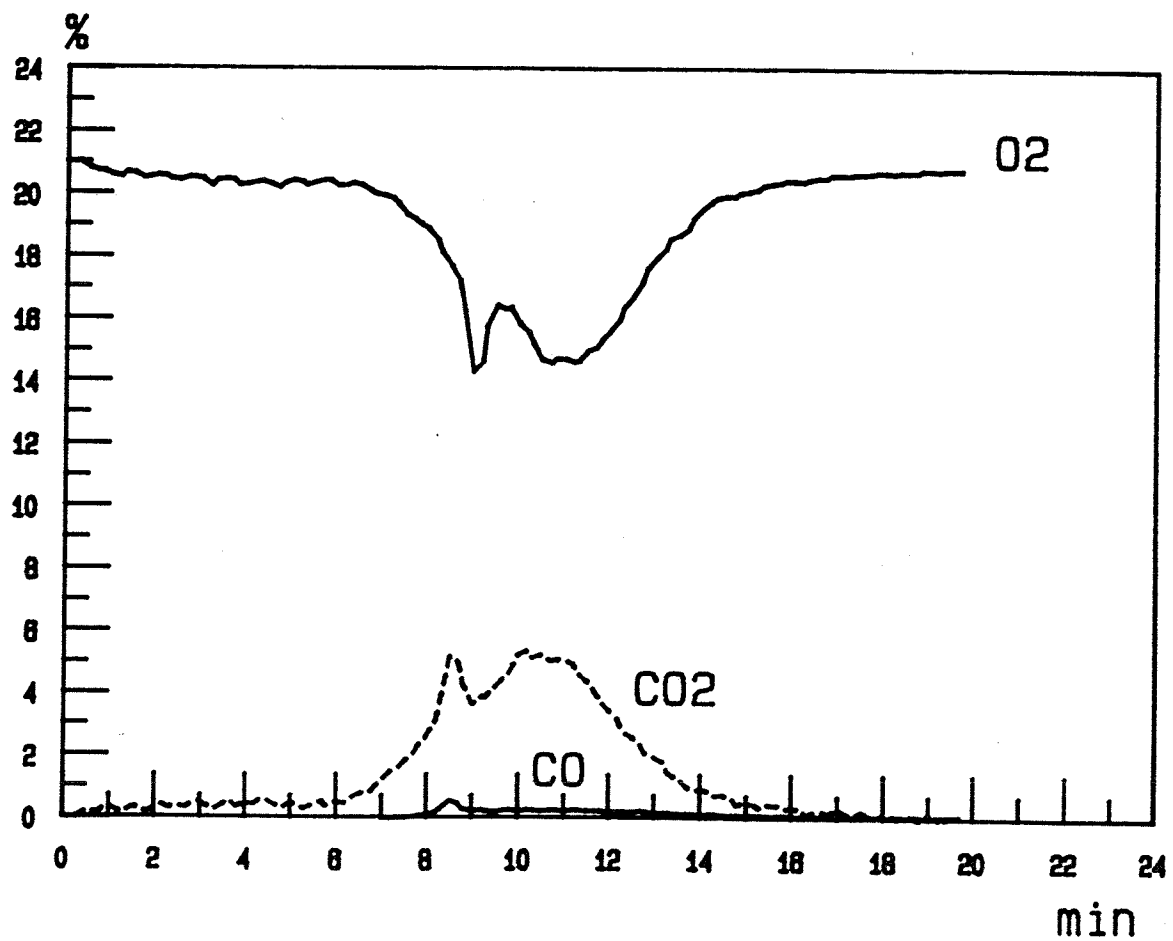
Temperaturen der Meßstellen 28 bis 30 bei Versuch 45.5



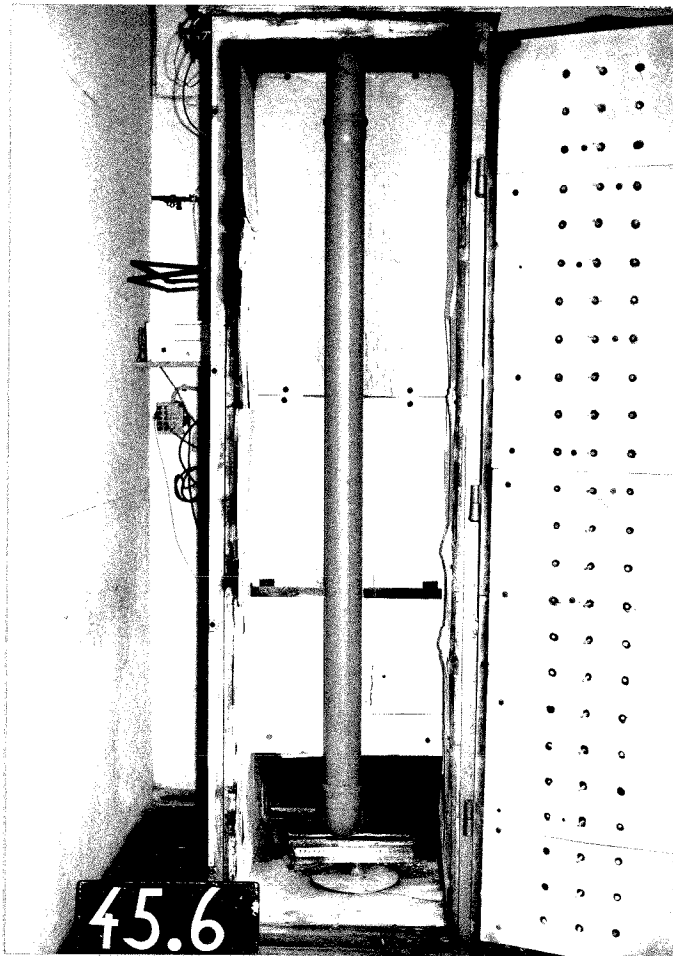
Temperatur und Flammenhoehe bei Versuch 45.6



Druckverlauf im Brandraum bei Versuch 45.6



CO₂, CO, O₂-Gehalt bei Versuch 45.6



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 45.8

Materialbeschreibung

Material Nr. 10 : 3 Abwasserrohre
aus Polypropylen

Abmessungen

Innendurchmesser/Außendurchmesser: 103,5 mm/109,5 mm
Zwischenraum zwischen den Proben : 16 mm

Beobachtungen während des Brandversuches Nr. 45.8 am 04.03.1988

| <u>Zeit nach Versuchsbeginn</u> | <u>Beobachtungen</u> |
|-------------------------------------|--|
| 0' | Zündung der Holzkrippe (2 kg) durch 2 mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 2' | Das Material tropft am Knie brennend ab. |
| 3' | Das Material ist unten durchgebrannt. |
| 5' | Flammenhöhe über 2 m. Material abgelöscht, da die Anlage hätte beschädigt werden können. Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0

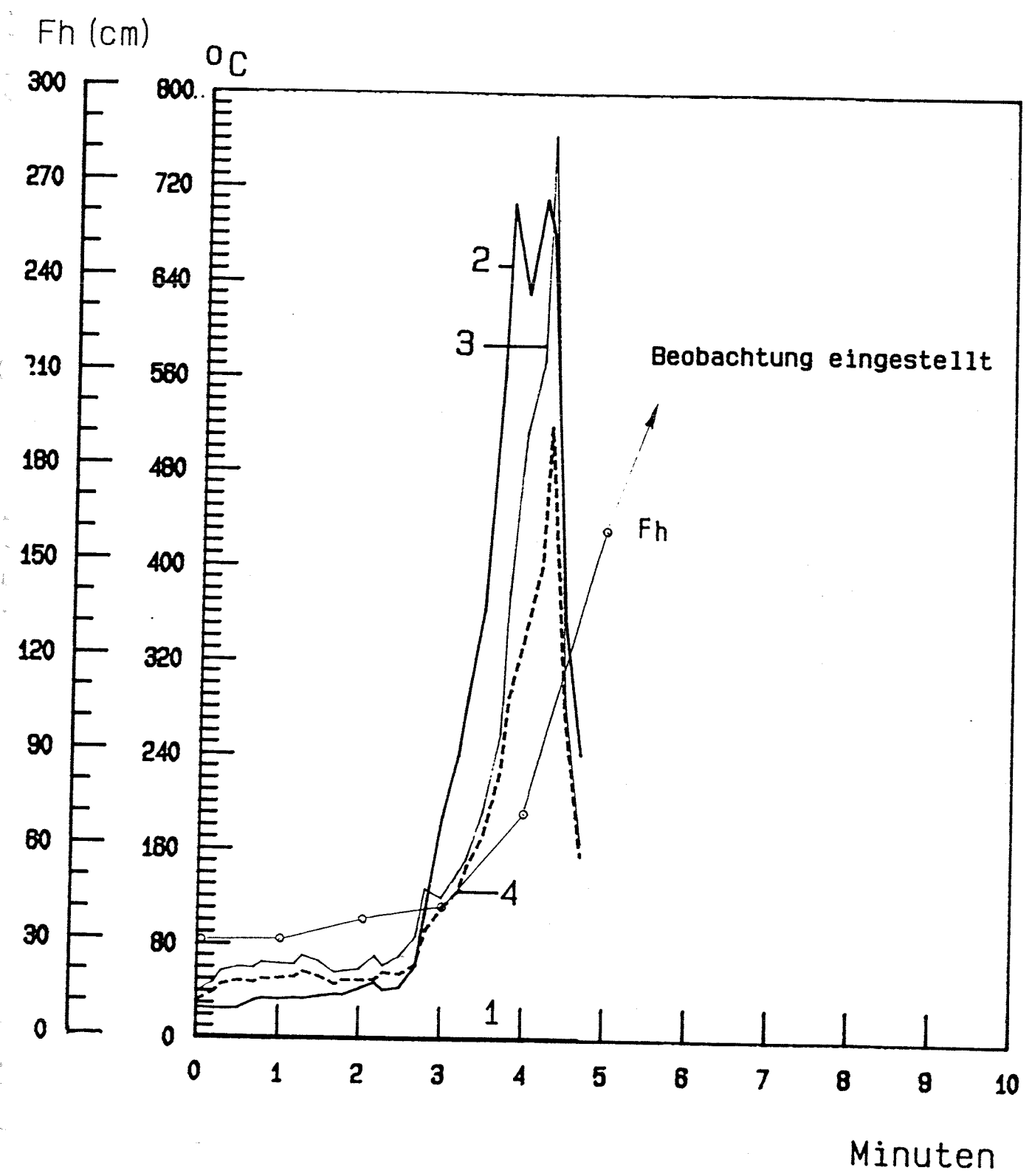
Das eingesetzte Versuchsmaterial ist vollständig verbrannt.

| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 0.9 | 15.0 | 11.4 | 13.5 | 8.5 | 10.4 | 11.8 | 12.2 | 13.0 | 13.9 | 13.8 | 13.3 | 13.5 | 13.7 |
| 1.00 | 0.8 | 24.6 | 15.1 | 24.7 | 18.8 | 24.5 | 33.2 | 34.5 | 45.2 | 51.2 | 48.9 | 42.2 | 41.3 | 38.7 |
| 2.00 | 0.8 | 47.4 | 28.8 | 50.4 | 25.8 | 32.5 | 47.2 | 52.2 | 66.3 | 72.0 | 69.4 | 66.9 | 64.3 | 62.6 |
| 3.00 | 0.9 | 187.1 | 42.4 | 38.0 | 36.6 | 42.1 | 47.7 | 58.3 | 69.9 | 69.3 | 63.4 | 61.9 | 59.7 | 59.2 |
| 4.00 | 0.9 | 166.5 | 81.2 | 99.4 | 81.1 | 185.5 | 238.4 | 197.7 | 199.6 | 184.9 | 147.8 | 123.0 | 122.9 | 130.0 |

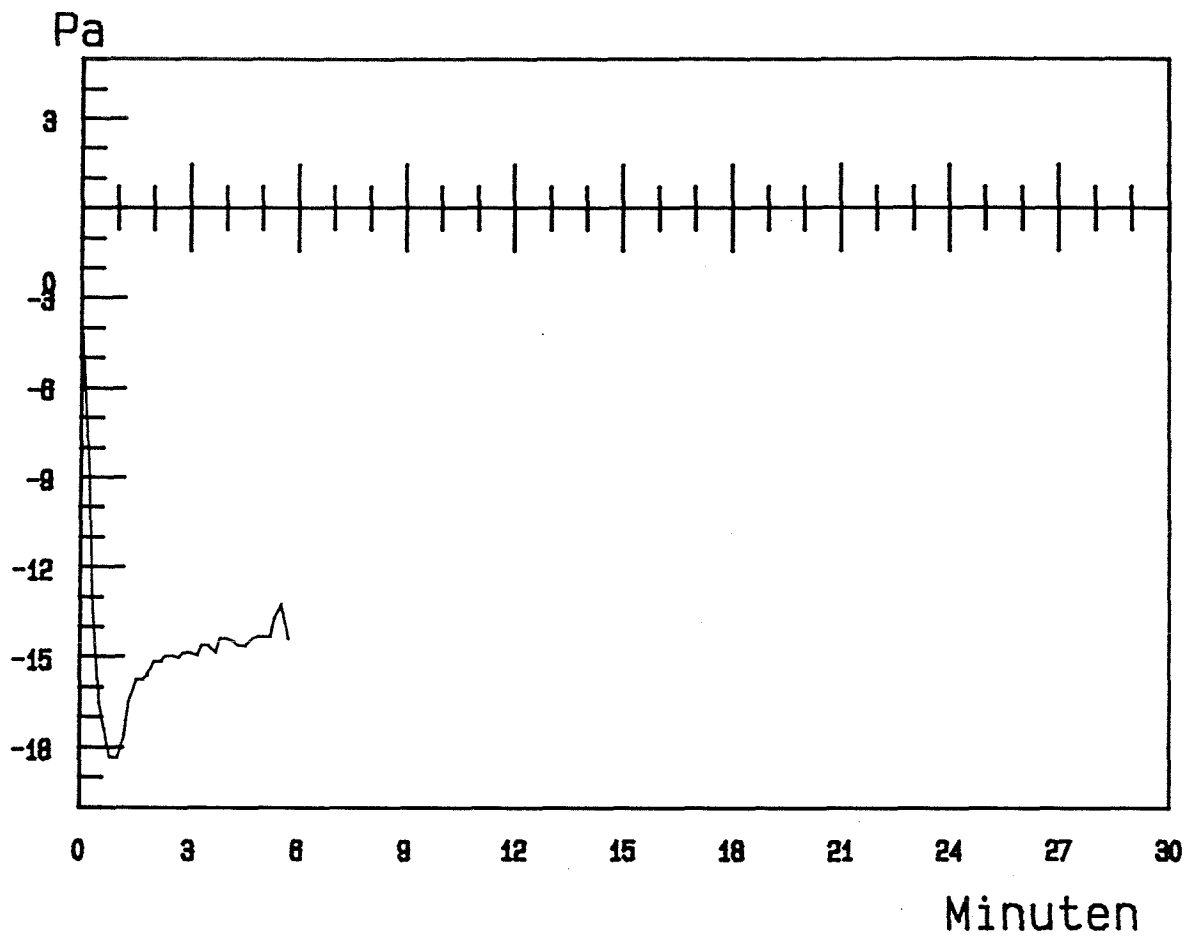
| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 13.8 | 14.4 | 14.4 | 14.4 | 14.5 | 15.1 | 15.1 | 15.8 | 16.3 | 16.5 | 17.2 | 17.5 | 17.4 |
| 1.00 | 38.3 | 38.6 | 37.2 | 35.8 | 33.6 | 34.3 | 30.8 | 33.4 | 31.7 | 29.7 | 32.8 | 33.1 | 32.2 |
| 2.00 | 62.8 | 63.6 | 60.6 | 58.8 | 55.9 | 57.5 | 53.4 | 56.0 | 54.7 | 51.6 | 53.8 | 53.6 | 49.9 |
| 3.00 | 58.4 | 57.7 | 55.5 | 54.3 | 51.3 | 51.5 | 51.2 | 51.6 | 50.8 | 49.0 | 49.5 | 50.1 | 48.0 |
| 4.00 | 119.1 | 119.4 | 116.7 | 112.3 | 110.1 | 116.4 | 106.3 | 117.3 | 115.3 | 105.8 | 116.3 | 116.6 | 106.8 |

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|------|
| 0.00 | 17.9 | 17.5 | 15.5 |
| 1.00 | 33.6 | 33.3 | 24.1 |
| 2.00 | 52.6 | 52.0 | 45.9 |
| 3.00 | 49.6 | 50.5 | 46.7 |
| 4.00 | 113.5 | 116.7 | 98.8 |

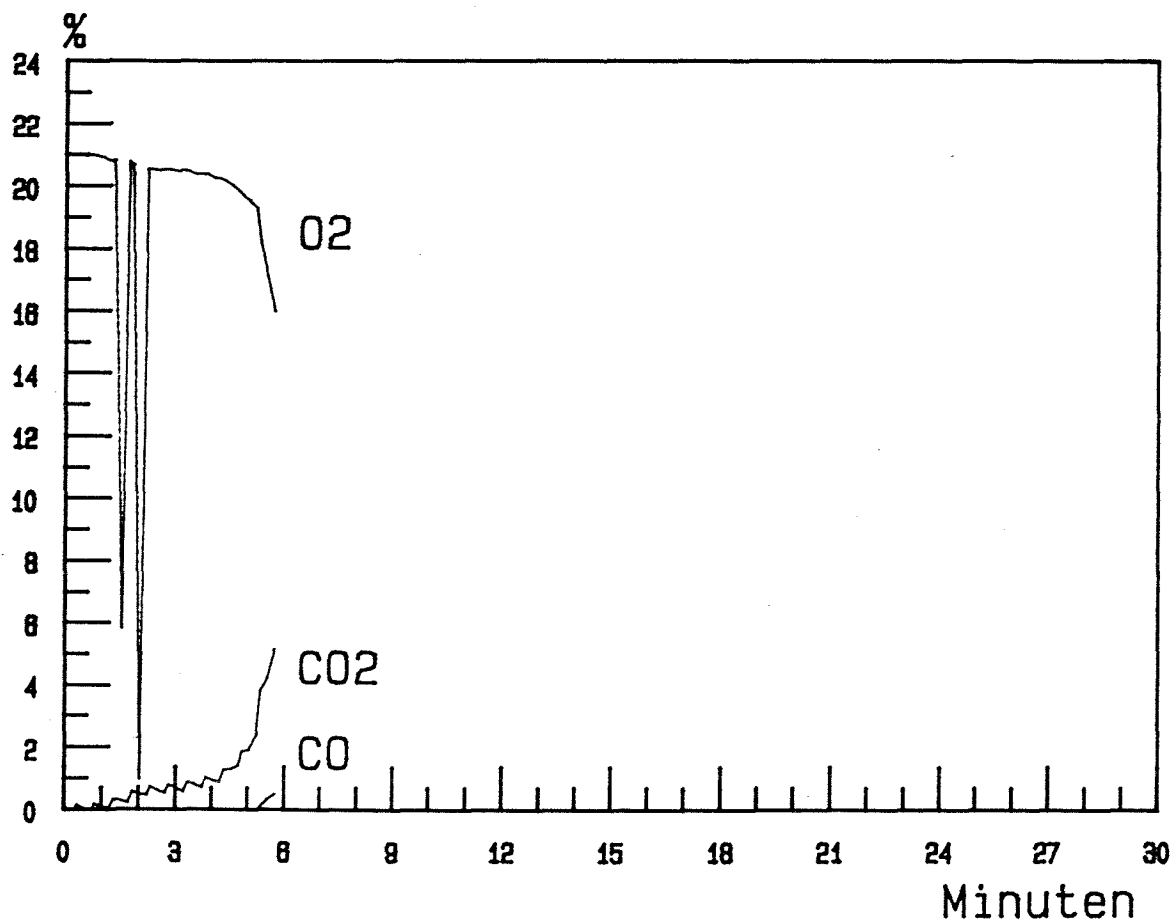
 Temperaturen der Meßstellen 1 bis 30 bei Versuch Nr. 45.8



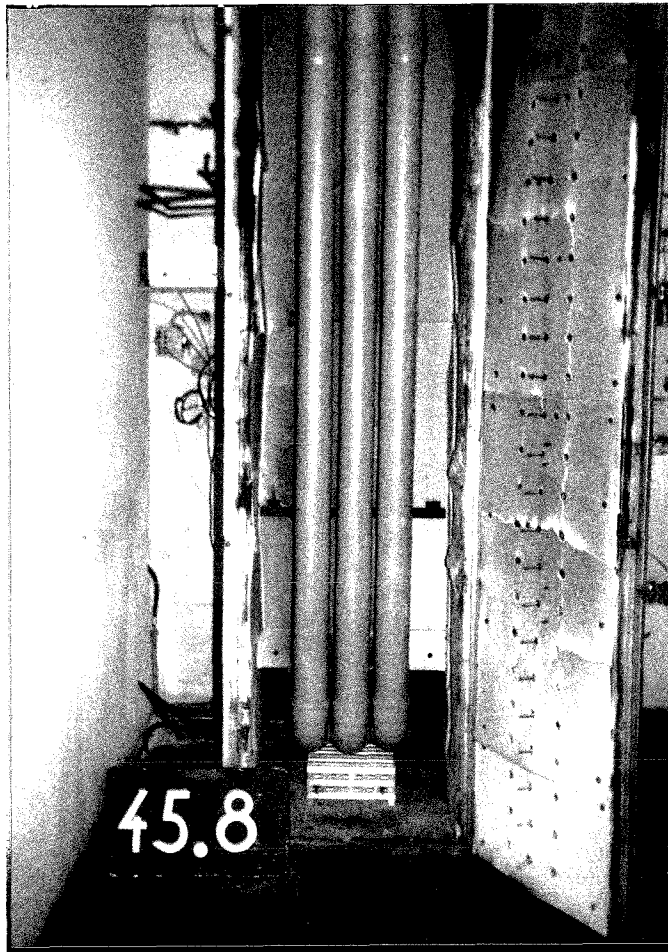
Temperatur und Flammenhoehe bei Versuch 45.1



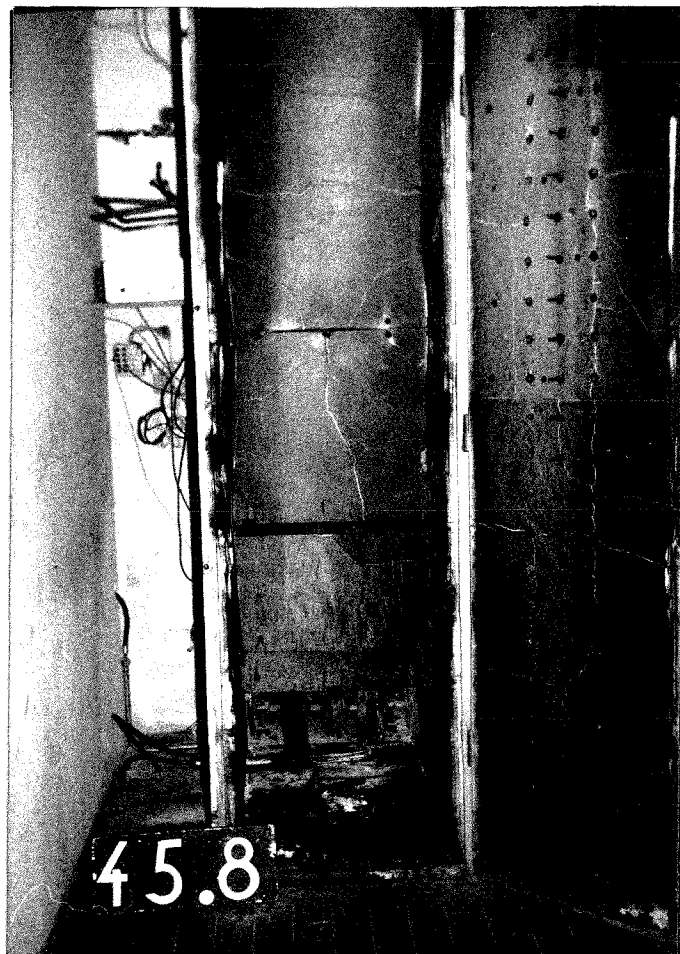
Druckverlauf im Brandraum bei Versuch 45.8



CO₂, CO, O₂-Gehalt bei Versuch 45.8



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 46.1

Materialbeschreibung

Material Nr. 11 : 3 PVC Abwasserrohre

Abmessungen

Innendurchmesser/Außendurchmesser: 105,0 mm/110,0 mm
Zwischenraum zwischen den Proben : 16 mm

Beobachtungen während des Brandversuches Nr. 46.1 am 07.03.1988

Zeit nach
Versuchsbeginn

Beobachtungen

| | | |
|-----|-----|--|
| 0' | | Zündung der Holzkrippe (2 kg) durch 2 mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 1' | 40" | Material tropft brennend ab. |
| 4' | | Material brennt unten mit. |
| 5' | | Die Rohre verformen sich. |
| 8' | | Rohr in der Mitte abgefallen. |
| 10' | | Keine Beobachtungen mehr möglich, da Scheiben verrußt. |
| 20' | | Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0

Das eingesetzte Versuchsmaterial ist vollständig verbrannt.

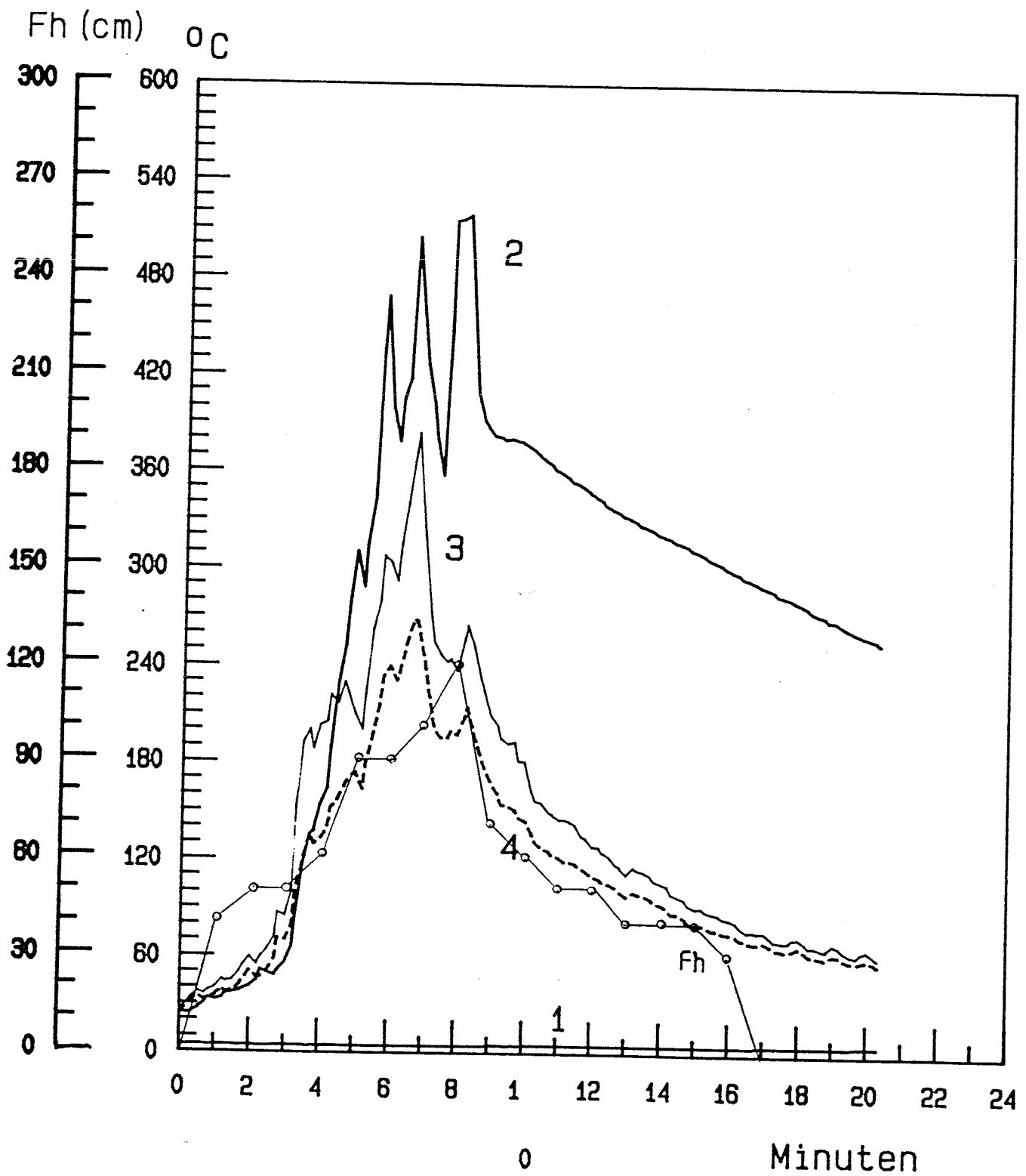
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 3.4 | 13.5 | 12.4 | 13.9 | 11.5 | 10.0 | 10.0 | 10.4 | 11.8 | 11.2 | 11.8 | 11.0 | 11.8 | 12.1 |
| 1.00 | 3.2 | 19.4 | 14.8 | 15.9 | 16.7 | 23.1 | 31.8 | 37.1 | 40.3 | 30.6 | 27.8 | 21.3 | 24.3 | 27.5 |
| 2.00 | 3.3 | 31.0 | 22.7 | 30.1 | 27.5 | 31.2 | 39.0 | 46.0 | 56.4 | 49.6 | 45.5 | 36.2 | 38.1 | 41.2 |
| 3.00 | 3.3 | 77.3 | 27.6 | 38.9 | 38.3 | 40.3 | 46.4 | 58.7 | 77.9 | 79.8 | 74.1 | 59.2 | 61.9 | 62.4 |
| 4.00 | 3.3 | 85.0 | 44.1 | 55.4 | 48.0 | 55.4 | 76.6 | 92.0 | 108.3 | 106.2 | 98.0 | 84.2 | 87.0 | 86.4 |
| 5.00 | 3.3 | 115.1 | 77.6 | 96.6 | 80.1 | 152.7 | 217.1 | 259.2 | 298.5 | 300.1 | 282.0 | 229.5 | 228.0 | 219.8 |
| 6.00 | 3.4 | 158.6 | 142.1 | 135.8 | 157.9 | 309.7 | 364.3 | 344.0 | 320.3 | 288.6 | 265.1 | 235.0 | 225.9 | 215.1 |
| 7.00 | 3.6 | 216.6 | 302.4 | 179.3 | 263.7 | 398.9 | 452.6 | 516.4 | 476.0 | 440.4 | 392.4 | 343.7 | 334.4 | 320.3 |
| 8.00 | 3.5 | 239.5 | 369.7 | 219.6 | 298.4 | 426.0 | 421.4 | 373.0 | 350.4 | 402.4 | 390.5 | 381.8 | 355.3 | 337.5 |
| 9.00 | 3.6 | 200.2 | 345.0 | 194.9 | 313.0 | 515.3 | 357.4 | 434.6 | 381.4 | 340.9 | 303.5 | 283.5 | 263.5 | 249.3 |
| 10.00 | 3.8 | 172.5 | 266.6 | 167.7 | 343.7 | 381.6 | 422.0 | 408.7 | 338.2 | 298.9 | 270.0 | 252.1 | 231.9 | 218.3 |
| 11.00 | 3.8 | 152.6 | 228.1 | 142.3 | 311.4 | 375.0 | 363.6 | 346.1 | 279.8 | 244.8 | 225.7 | 211.2 | 198.3 | 186.1 |
| 12.00 | 3.9 | 128.3 | 199.5 | 119.3 | 275.9 | 358.6 | 295.2 | 277.4 | 223.7 | 196.6 | 184.0 | 172.7 | 160.5 | 150.9 |
| 13.00 | 4.0 | 117.6 | 183.0 | 107.0 | 262.0 | 344.5 | 246.0 | 230.9 | 184.1 | 162.8 | 157.0 | 150.7 | 140.4 | 132.5 |
| 14.00 | 4.1 | 103.2 | 177.9 | 101.0 | 236.8 | 331.1 | 194.0 | 187.0 | 150.0 | 134.6 | 130.2 | 129.1 | 119.6 | 114.1 |
| 15.00 | 4.2 | 98.4 | 149.7 | 92.6 | 217.9 | 320.1 | 191.9 | 173.8 | 143.4 | 130.3 | 125.7 | 120.1 | 113.4 | 107.9 |
| 16.00 | 4.1 | 86.7 | 127.9 | 80.4 | 199.9 | 309.9 | 144.1 | 135.2 | 109.0 | 100.1 | 104.5 | 102.5 | 97.0 | 92.9 |
| 17.00 | 4.1 | 80.3 | 115.6 | 75.1 | 179.6 | 298.7 | 131.0 | 121.4 | 102.5 | 96.8 | 96.9 | 93.8 | 89.8 | 85.8 |
| 18.00 | 4.3 | 74.4 | 101.2 | 68.6 | 163.3 | 288.2 | 113.8 | 104.4 | 88.9 | 84.0 | 86.8 | 84.0 | 81.1 | 78.4 |
| 19.00 | 4.3 | 70.1 | 94.1 | 65.8 | 152.2 | 278.5 | 104.6 | 95.6 | 83.8 | 80.9 | 81.6 | 78.4 | 76.6 | 73.9 |
| 20.00 | 4.5 | 65.2 | 87.5 | 63.9 | 144.4 | 268.1 | 95.0 | 88.7 | 79.5 | 77.1 | 78.2 | 73.3 | 72.5 | 69.8 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 11.6 | 12.0 | 13.3 | 13.8 | 14.3 | 14.2 | 13.4 | 14.0 | 14.2 | 13.9 | 15.2 | 15.4 | 16.5 |
| 1.00 | 24.6 | 29.4 | 26.0 | 27.4 | 24.5 | 25.5 | 23.2 | 24.6 | 23.9 | 22.7 | 24.4 | 25.0 | 24.8 |
| 2.00 | 38.8 | 41.9 | 39.3 | 38.8 | 36.2 | 37.7 | 34.7 | 36.0 | 35.8 | 34.0 | 36.3 | 36.6 | 34.6 |
| 3.00 | 58.3 | 61.9 | 56.7 | 55.8 | 51.8 | 54.2 | 50.2 | 52.9 | 52.4 | 49.1 | 53.2 | 54.0 | 51.5 |
| 4.00 | 83.6 | 87.8 | 82.7 | 81.1 | 75.4 | 79.1 | 73.5 | 76.3 | 75.8 | 71.7 | 76.1 | 76.1 | 72.8 |
| 5.00 | 202.4 | 207.7 | 184.8 | 174.6 | 158.3 | 164.4 | 149.6 | 153.1 | 150.5 | 140.5 | 147.1 | 147.4 | 137.7 |
| 6.00 | 209.6 | 210.7 | 206.4 | 200.6 | 191.1 | 198.0 | 186.2 | 191.9 | 192.5 | 181.8 | 190.4 | 192.5 | 180.8 |
| 7.00 | 303.1 | 302.8 | 291.3 | 281.1 | 266.8 | 275.0 | 256.6 | 260.7 | 263.1 | 247.9 | 262.0 | 266.2 | 247.8 |
| 8.00 | 320.5 | 316.3 | 309.1 | 299.0 | 286.0 | 287.8 | 275.5 | 272.9 | 275.6 | 263.9 | 265.7 | 265.3 | 249.4 |
| 9.00 | 236.0 | 230.2 | 227.4 | 222.7 | 219.6 | 218.5 | 216.8 | 210.8 | 213.9 | 209.7 | 208.5 | 208.2 | 200.9 |
| 10.00 | 208.8 | 199.1 | 196.6 | 192.0 | 186.6 | 181.8 | 184.4 | 174.2 | 178.2 | 178.5 | 172.6 | 172.3 | 170.2 |
| 11.00 | 180.0 | 171.1 | 169.1 | 165.2 | 161.4 | 157.1 | 158.3 | 149.2 | 152.4 | 153.2 | 147.6 | 146.8 | 145.8 |
| 12.00 | 144.5 | 133.8 | 135.3 | 132.1 | 133.4 | 128.9 | 132.1 | 124.3 | 127.8 | 130.0 | 124.7 | 123.5 | 124.0 |
| 13.00 | 127.9 | 118.6 | 120.0 | 117.3 | 118.1 | 114.6 | 117.2 | 110.5 | 114.1 | 116.0 | 111.6 | 111.1 | 111.2 |
| 14.00 | 110.4 | 102.7 | 104.1 | 101.2 | 102.8 | 99.8 | 103.0 | 97.1 | 100.2 | 102.5 | 97.8 | 97.3 | 98.0 |
| 15.00 | 105.0 | 98.9 | 99.7 | 96.8 | 97.2 | 95.2 | 96.7 | 92.2 | 95.5 | 96.5 | 93.7 | 93.6 | 93.4 |
| 16.00 | 90.0 | 83.9 | 85.7 | 83.0 | 85.0 | 82.2 | 84.7 | 80.1 | 83.0 | 84.6 | 80.5 | 80.1 | 81.2 |
| 17.00 | 83.4 | 78.2 | 80.0 | 77.5 | 79.0 | 77.1 | 78.5 | 75.4 | 78.0 | 78.8 | 75.9 | 75.6 | 76.2 |
| 18.00 | 75.6 | 70.8 | 72.4 | 70.5 | 72.1 | 70.5 | 71.7 | 69.4 | 71.6 | 72.3 | 70.4 | 70.2 | 70.8 |
| 19.00 | 72.4 | 69.5 | 70.3 | 69.1 | 69.2 | 68.3 | 68.3 | 66.9 | 68.6 | 68.6 | 67.6 | 67.5 | 67.8 |
| 20.00 | 68.4 | 65.6 | 66.1 | 64.7 | 65.1 | 64.2 | 64.1 | 62.9 | 64.3 | 64.5 | 63.5 | 63.1 | 63.6 |

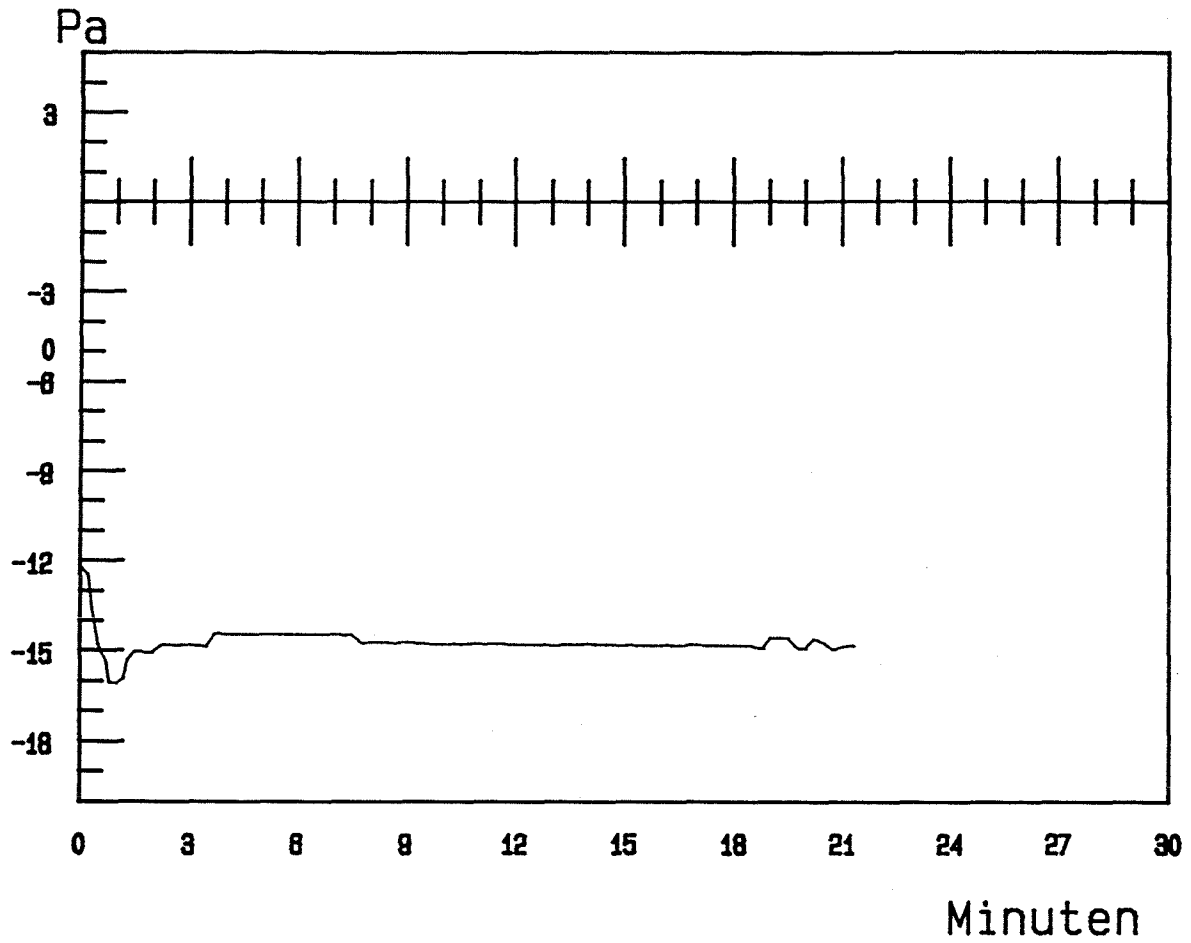
Temperaturen der Meßstellen 1 bis 27 bei Versuch 46.1

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 16.3 | 15.4 | 16.9 |
| 1.00 | 24.3 | 23.9 | 18.7 |
| 2.00 | 35.1 | 35.9 | 30.2 |
| 3.00 | 51.7 | 50.8 | 47.1 |
| 4.00 | 73.3 | 70.6 | 63.7 |
| 5.00 | 139.4 | 135.0 | 118.6 |
| 6.00 | 182.9 | 180.3 | 156.0 |
| 7.00 | 256.2 | 254.6 | 205.2 |
| 8.00 | 254.3 | 255.2 | 224.2 |
| 9.00 | 201.2 | 204.8 | 184.0 |
| 10.00 | 168.2 | 173.5 | 158.3 |
| 11.00 | 143.9 | 149.6 | 136.5 |
| 12.00 | 121.7 | 125.6 | 114.8 |
| 13.00 | 110.0 | 114.2 | 103.4 |
| 14.00 | 97.0 | 100.1 | 94.5 |
| 15.00 | 93.0 | 96.1 | 87.7 |
| 16.00 | 80.4 | 82.9 | 75.5 |
| 17.00 | 75.5 | 77.4 | 70.4 |
| 18.00 | 70.2 | 71.9 | 66.0 |
| 19.00 | 67.2 | 68.1 | 63.9 |
| 20.00 | 62.9 | 63.6 | 59.8 |

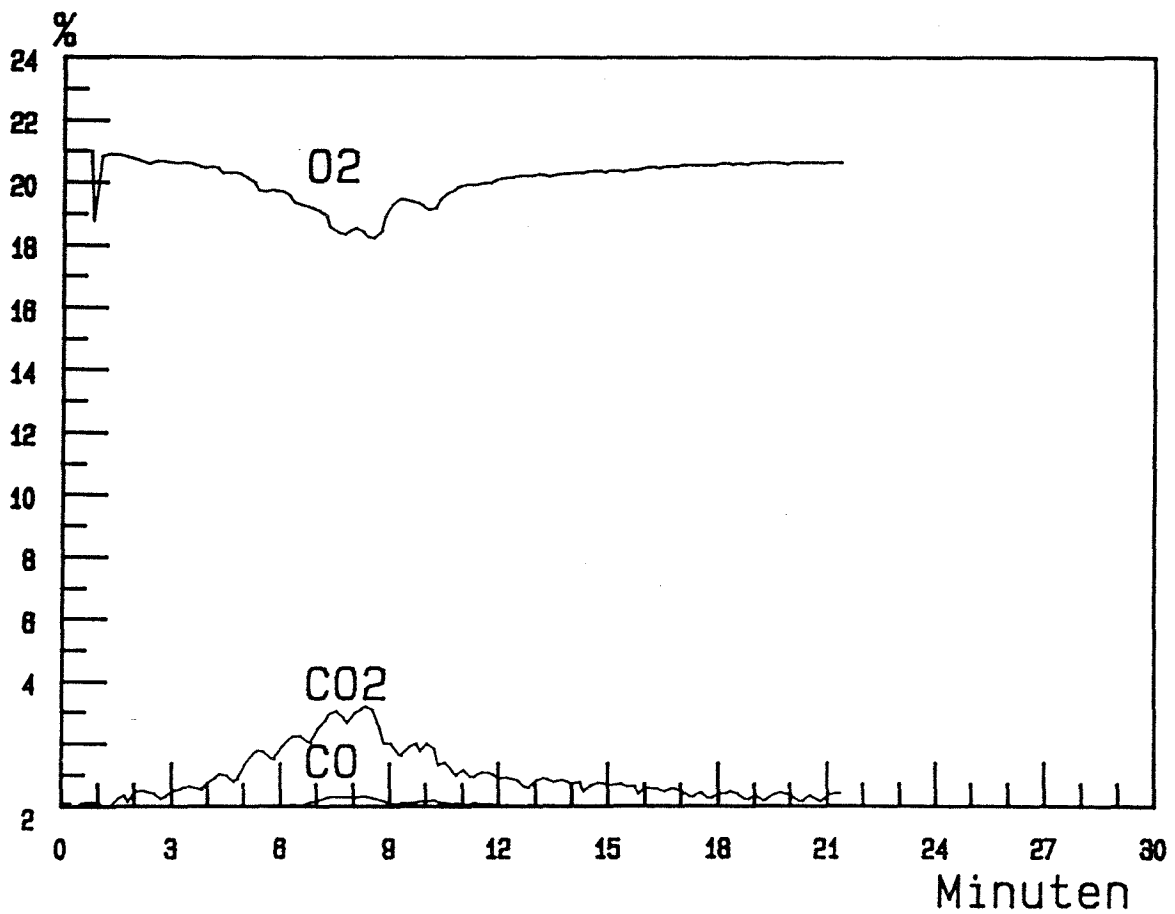
Temperaturen der Meßstellen 28 bis 30 bei Versuch 46.1



Temperatur und Flammenhoehe bei Versuch 46.1



Druckverlauf im Brandraum bei Versuch 46.1



CO₂, CO, O₂-Gehalt bei Versuch 46.1



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 46.2

Materialbeschreibung

Material Nr. 11 : 3 PVC Abwasserrohre

Abmessungen

Innendurchmesser/Außendurchmesser: 105,0 mm/110,0 mm
Zwischenraum zwischen den Proben : 16 mm

Beobachtungen während des Brandversuches Nr. 46.2 am 16.03.1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|--|
| 0' | Zündung des Gasbrenners. |
| 2' | Material brennt. |
| 3' 30" | Material bis in 60 cm Höhe vom Knie aus gemessen, angeschmolzen. |
| 7' | Material unten durchgebrannt. |
| 8' | Abgefallenes Material brennt am Boden mit. |
| 10' 45" | Erstes und zweites Rohr auf den Brandraumboden abgesackt und brennt am Boden weiter. |
| 17' 30" | Letztes Rohr abgesackt, Flammenhöhe nimmt zu. |
| 8' - 20' | Am Boden aufliegendes Material brennt mit den Gasflammen mit. |
| 20' | Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0

Das eingesetzte Versuchsmaterial weitgehende zerstört.

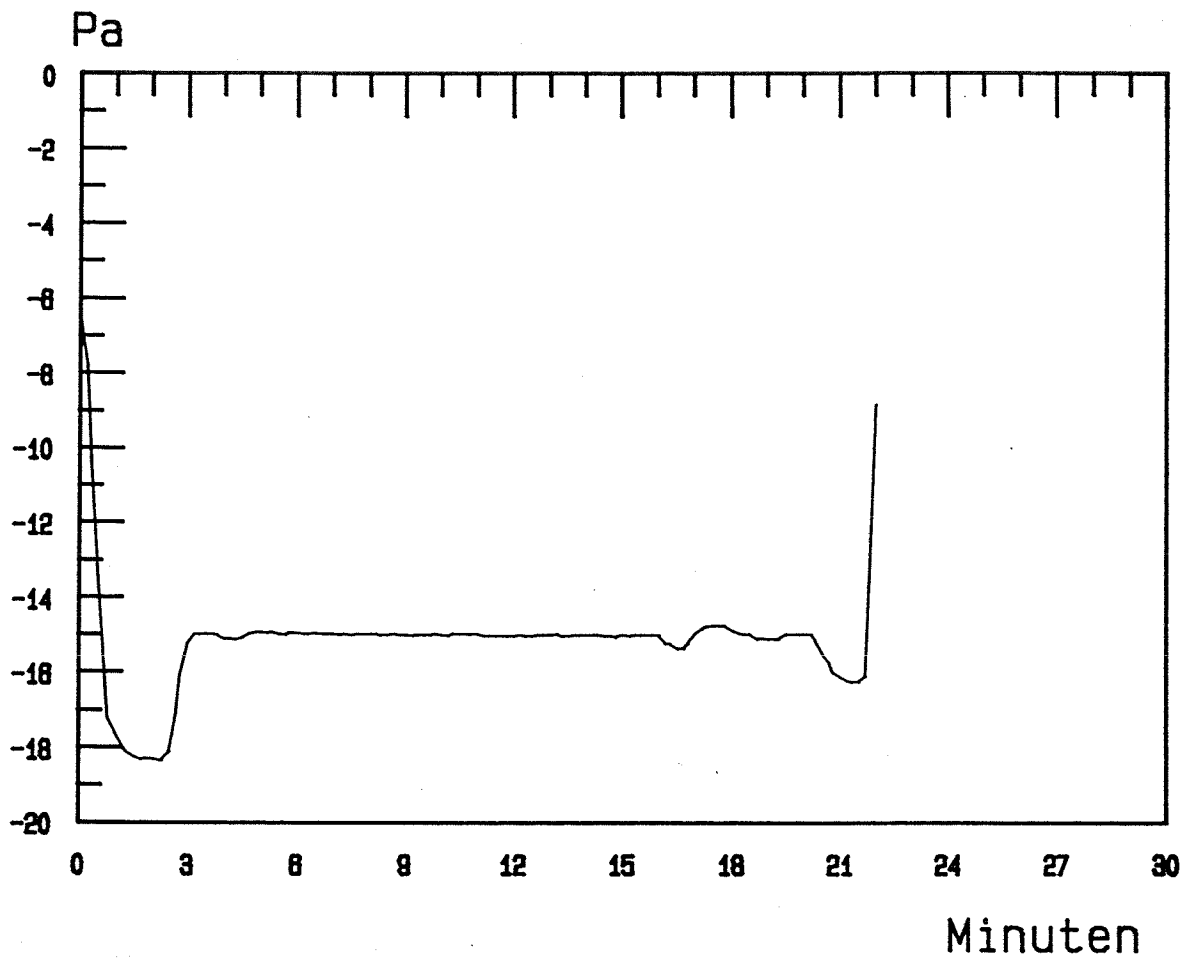
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 5.9 | 23.0 | 470.6 | 155.0 | 15.6 | 16.0 | 17.3 | 15.7 | 16.7 | 16.3 | 18.5 | 16.9 | 19.0 | 18.2 |
| 1.00 | 5.9 | 39.4 | 58.2 | 43.0 | 45.0 | 56.5 | 69.2 | 77.9 | 114.7 | 110.8 | 100.8 | 72.3 | 82.7 | 72.8 |
| 2.00 | 6.0 | 59.6 | 57.8 | 58.4 | 79.3 | 104.8 | 131.0 | 134.6 | 161.8 | 172.8 | 158.2 | 120.9 | 128.0 | 119.9 |
| 3.00 | 6.0 | 81.9 | 98.6 | 108.4 | 91.6 | 109.1 | 116.5 | 131.6 | 137.1 | 153.6 | 166.0 | 147.4 | 155.4 | 147.1 |
| 4.00 | 6.1 | 104.5 | 89.7 | 86.0 | 98.0 | 117.6 | 140.4 | 152.1 | 170.1 | 173.5 | 159.2 | 134.2 | 133.1 | 129.9 |
| 5.00 | 6.1 | 100.6 | 130.6 | 111.3 | 116.6 | 146.0 | 181.8 | 197.7 | 222.6 | 233.9 | 202.4 | 166.0 | 161.7 | 157.3 |
| 6.00 | 6.1 | 114.9 | 160.3 | 114.7 | 146.0 | 189.2 | 240.0 | 281.8 | 294.7 | 277.1 | 230.0 | 186.3 | 174.8 | 164.8 |
| 7.00 | 6.1 | 126.0 | 186.0 | 126.1 | 171.2 | 222.3 | 277.5 | 308.9 | 317.4 | 300.1 | 254.3 | 210.2 | 195.5 | 178.9 |
| 8.00 | 6.1 | 135.6 | 222.1 | 125.2 | 179.7 | 237.4 | 298.2 | 325.9 | 325.3 | 297.1 | 254.3 | 207.9 | 187.3 | 173.1 |
| 9.00 | 6.2 | 156.0 | 247.2 | 164.8 | 250.5 | 318.1 | 354.6 | 388.5 | 402.9 | 375.0 | 312.5 | 259.7 | 242.8 | 224.8 |
| 10.00 | 6.2 | 152.6 | 260.3 | 157.2 | 244.8 | 310.2 | 372.7 | 435.5 | 421.4 | 372.7 | 300.7 | 250.1 | 231.7 | 209.2 |
| 11.00 | 6.3 | 158.5 | 276.6 | 151.5 | 220.3 | 280.1 | 332.6 | 398.8 | 375.2 | 333.6 | 275.2 | 243.4 | 222.5 | 204.4 |
| 12.00 | 6.3 | 148.6 | 277.4 | 142.2 | 200.0 | 304.6 | 360.1 | 387.4 | 356.8 | 310.6 | 255.2 | 225.7 | 206.7 | 186.8 |
| 13.00 | 6.4 | 152.3 | 279.9 | 140.8 | 194.3 | 330.9 | 408.4 | 430.4 | 404.1 | 360.6 | 300.0 | 250.4 | 233.3 | 214.8 |
| 14.00 | 6.5 | 152.9 | 266.9 | 136.2 | 189.5 | 309.6 | 361.8 | 404.9 | 384.0 | 348.6 | 290.8 | 245.3 | 224.2 | 204.0 |
| 15.00 | 6.5 | 153.8 | 263.9 | 139.9 | 182.9 | 301.0 | 361.9 | 396.5 | 388.1 | 350.5 | 301.5 | 255.6 | 237.5 | 216.0 |
| 16.00 | 6.5 | 150.7 | 265.0 | 132.8 | 174.0 | 294.5 | 345.3 | 379.7 | 365.9 | 336.7 | 295.0 | 249.2 | 235.4 | 214.7 |
| 17.00 | 6.6 | 158.0 | 256.2 | 149.9 | 190.0 | 279.3 | 325.7 | 360.6 | 348.3 | 329.5 | 292.6 | 253.0 | 234.2 | 217.1 |
| 18.00 | 6.6 | 160.4 | 294.1 | 141.3 | 212.3 | 227.4 | 338.7 | 371.4 | 378.8 | 364.3 | 319.8 | 263.6 | 242.6 | 224.3 |
| 19.00 | 6.7 | 166.8 | 312.7 | 149.9 | 281.1 | 217.5 | 360.4 | 381.5 | 384.8 | 360.1 | 317.6 | 261.5 | 239.0 | 220.0 |
| 20.00 | 6.7 | 183.5 | 407.1 | 187.9 | 290.6 | 337.8 | 714.9 | 641.3 | 672.1 | 530.4 | 448.6 | 343.2 | 309.7 | 284.3 |
| 21.00 | 6.6 | 117.6 | 196.0 | 92.1 | 285.4 | 263.4 | 226.6 | 245.7 | 165.0 | 185.4 | 155.8 | 170.7 | 156.7 | 137.0 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 22.5 | 20.2 | 30.6 | 28.1 | 29.7 | 28.7 | 27.7 | 28.9 | 27.2 | 24.1 | 23.1 | 20.7 | 19.4 |
| 1.00 | 97.2 | 95.5 | 124.4 | 118.4 | 109.2 | 107.0 | 97.3 | 103.9 | 95.6 | 86.4 | 78.7 | 72.3 | 62.2 |
| 2.00 | 134.7 | 137.2 | 153.7 | 145.4 | 136.7 | 134.3 | 124.2 | 130.8 | 125.1 | 116.4 | 108.7 | 102.7 | 88.9 |
| 3.00 | 158.0 | 160.4 | 171.6 | 165.3 | 158.2 | 157.1 | 148.5 | 151.6 | 146.1 | 137.0 | 129.9 | 123.7 | 118.0 |
| 4.00 | 124.5 | 120.2 | 126.7 | 122.1 | 116.8 | 114.6 | 111.5 | 111.7 | 109.4 | 104.9 | 101.7 | 98.9 | 96.6 |
| 5.00 | 152.6 | 149.6 | 152.4 | 145.7 | 138.6 | 137.3 | 132.6 | 134.1 | 132.5 | 127.8 | 124.5 | 121.0 | 117.6 |
| 6.00 | 162.8 | 162.0 | 161.6 | 155.4 | 148.0 | 148.1 | 143.2 | 144.5 | 142.2 | 136.8 | 134.4 | 131.4 | 125.6 |
| 7.00 | 169.8 | 163.4 | 163.1 | 154.3 | 147.8 | 147.2 | 141.4 | 141.5 | 142.1 | 138.4 | 137.0 | 134.8 | 130.8 |
| 8.00 | 162.2 | 158.9 | 155.9 | 147.1 | 141.7 | 142.9 | 136.7 | 134.8 | 137.3 | 134.0 | 133.4 | 133.7 | 128.4 |
| 9.00 | 224.1 | 218.9 | 213.3 | 199.3 | 182.8 | 184.8 | 173.1 | 173.8 | 172.8 | 164.4 | 164.2 | 162.0 | 153.9 |
| 10.00 | 205.5 | 196.5 | 190.4 | 179.7 | 168.7 | 169.5 | 162.1 | 160.4 | 160.7 | 155.2 | 156.0 | 153.6 | 148.1 |
| 11.00 | 205.5 | 195.8 | 191.9 | 184.6 | 175.2 | 177.5 | 170.9 | 169.9 | 171.8 | 164.6 | 166.9 | 164.1 | 158.5 |
| 12.00 | 188.3 | 179.2 | 177.6 | 172.6 | 165.9 | 167.4 | 163.5 | 161.4 | 164.9 | 159.3 | 161.5 | 158.9 | 155.0 |
| 13.00 | 223.8 | 203.5 | 202.1 | 191.3 | 182.8 | 184.6 | 176.6 | 174.9 | 177.4 | 170.4 | 173.7 | 170.3 | 165.1 |
| 14.00 | 207.1 | 195.9 | 193.2 | 185.6 | 177.4 | 178.5 | 173.4 | 170.3 | 173.7 | 167.9 | 170.6 | 166.9 | 161.6 |
| 15.00 | 222.3 | 206.2 | 203.3 | 192.7 | 182.8 | 184.9 | 178.0 | 173.1 | 176.4 | 170.1 | 172.5 | 168.6 | 162.7 |
| 16.00 | 224.7 | 204.6 | 204.1 | 192.4 | 184.2 | 184.7 | 177.6 | 172.9 | 175.6 | 169.6 | 171.9 | 167.7 | 162.6 |
| 17.00 | 220.3 | 207.7 | 204.4 | 193.5 | 184.1 | 184.8 | 178.1 | 173.1 | 176.2 | 171.0 | 172.8 | 169.9 | 164.1 |
| 18.00 | 222.8 | 212.2 | 206.0 | 193.3 | 184.3 | 185.4 | 178.0 | 171.5 | 174.5 | 168.7 | 168.6 | 165.0 | 159.8 |
| 19.00 | 218.7 | 207.0 | 204.3 | 194.7 | 187.5 | 187.8 | 180.5 | 175.3 | 178.8 | 172.9 | 175.6 | 171.3 | 165.0 |
| 20.00 | 280.6 | 264.8 | 255.0 | 237.2 | 221.6 | 226.1 | 211.5 | 209.7 | 213.0 | 200.8 | 208.3 | 203.1 | 191.8 |
| 21.00 | 110.1 | 105.2 | 106.0 | 108.3 | 113.1 | 102.7 | 115.5 | 99.3 | 106.0 | 113.0 | 99.0 | 100.2 | 108.2 |

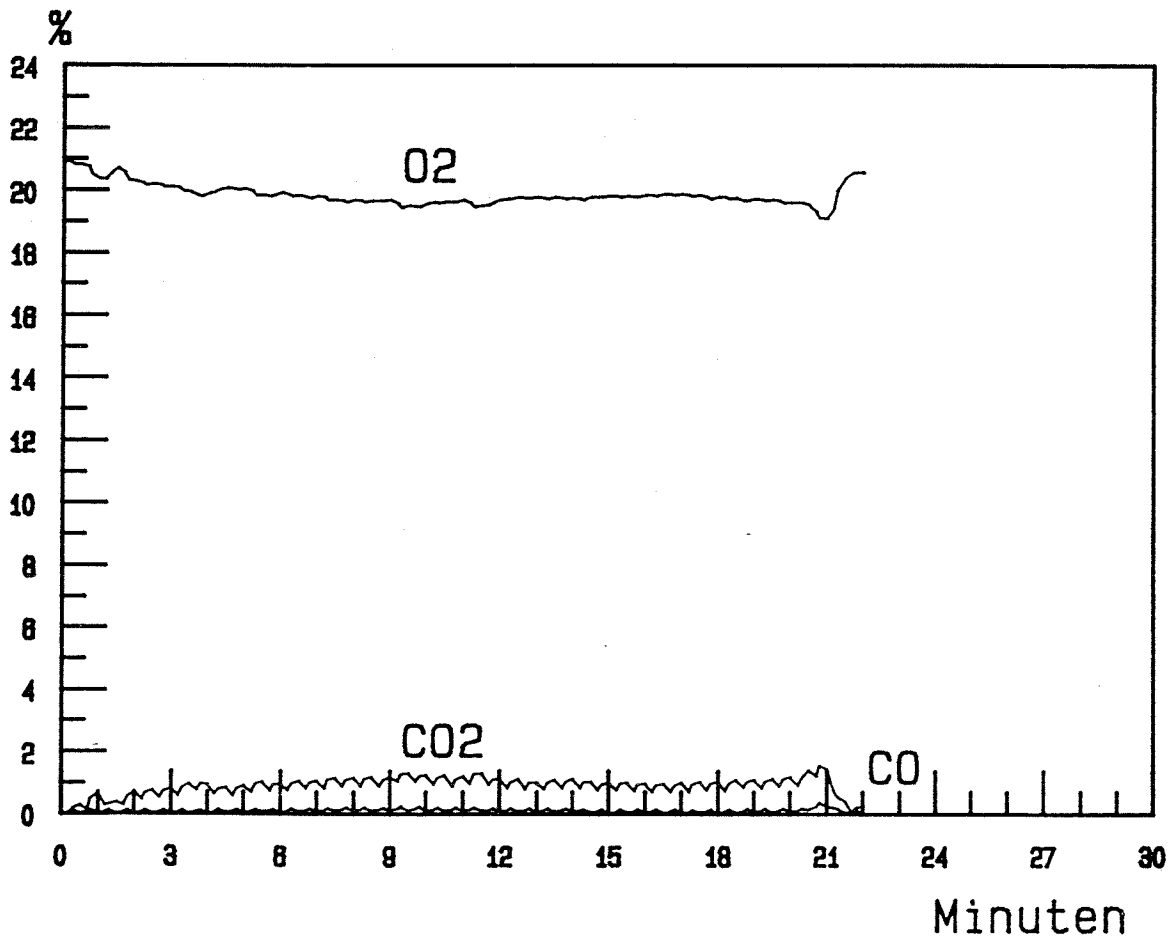
Temperaturen der Meßstellen 1 bis 27 bei Versuch 46.2

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 20.6 | 22.5 | 28.1 |
| 1.00 | 65.5 | 52.9 | 47.1 |
| 2.00 | 93.5 | 77.9 | 70.4 |
| 3.00 | 114.2 | 96.7 | 99.0 |
| 4.00 | 94.4 | 86.0 | 80.4 |
| 5.00 | 115.1 | 104.9 | 99.4 |
| 6.00 | 124.3 | 116.4 | 108.5 |
| 7.00 | 129.4 | 124.8 | 118.2 |
| 8.00 | 129.3 | 130.3 | 122.5 |
| 9.00 | 156.5 | 152.3 | 136.6 |
| 10.00 | 151.0 | 146.5 | 137.9 |
| 11.00 | 160.4 | 153.7 | 143.9 |
| 12.00 | 156.3 | 149.7 | 151.4 |
| 13.00 | 166.6 | 157.0 | 150.4 |
| 14.00 | 163.2 | 154.5 | 147.1 |
| 15.00 | 164.2 | 155.9 | 146.2 |
| 16.00 | 163.4 | 154.2 | 143.9 |
| 17.00 | 165.8 | 158.2 | 148.5 |
| 18.00 | 161.5 | 158.6 | 145.6 |
| 19.00 | 167.0 | 164.1 | 145.9 |
| 20.00 | 195.9 | 187.1 | 172.7 |
| 21.00 | 102.8 | 111.5 | 94.1 |

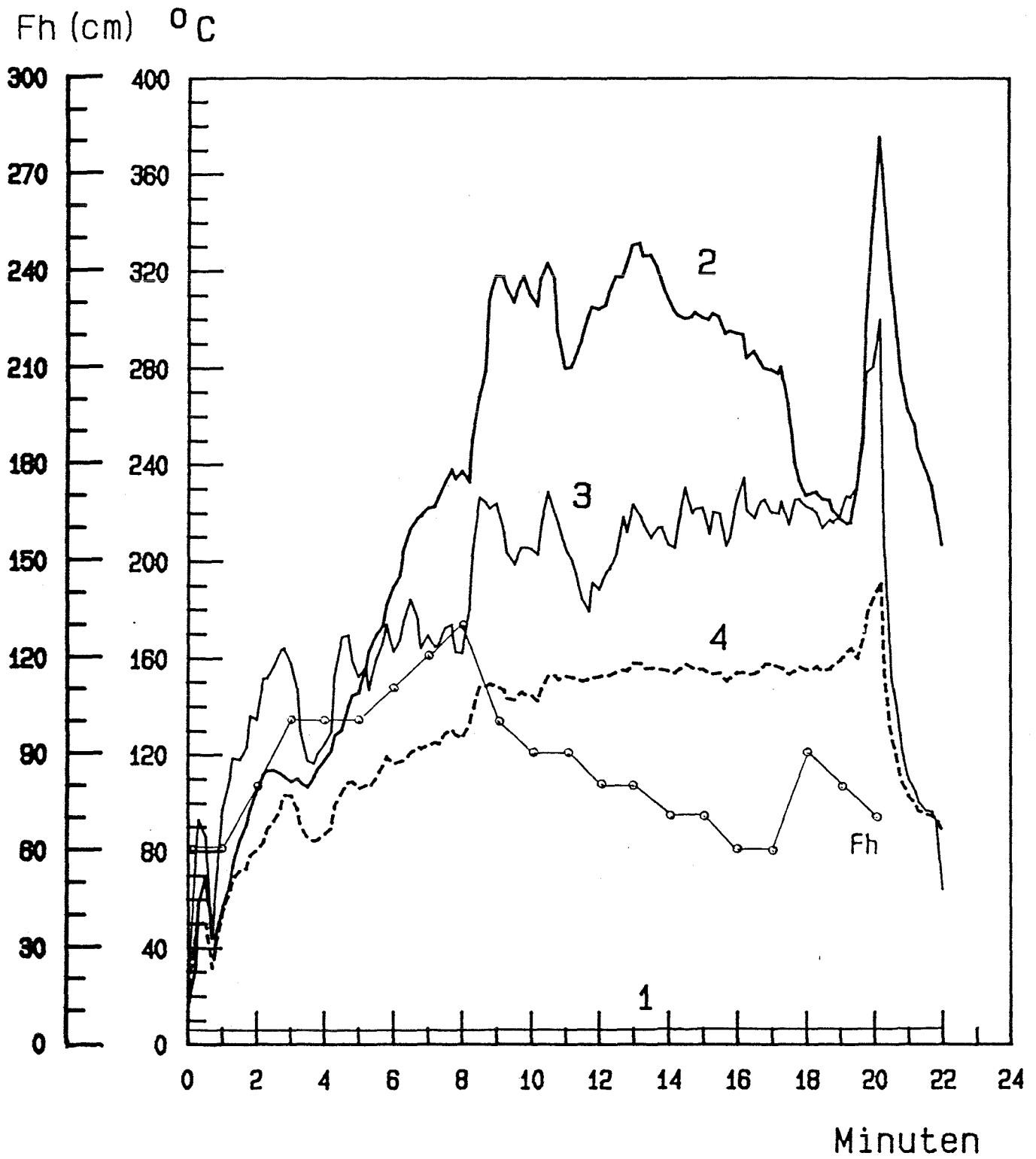
Temperaturen der Meßstellen 28 bis 30 bei Versuch 46.2



Druckverlauf im Brandraum bei Versuch 46.2



CO₂, CO, O₂-Gehalt bei Versuch 46.2



Temperatur und Flammenhoehe bei Versuch 46.2



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 47.1

Materialbeschreibung

Materialbeschreibung

Material Nr. 12 : 1 Abwasserrohr
ABS/ASA/PVC

Abmessungen

Innendurchmesser/Außendurchmesser: 106,0 mm/111,0 mm
Zwischenraum zwischen den Proben :

Beobachtungen während des Brandversuches Nr. 47.1 am 14.03.1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|---|
| 0' | Zündung der Holzkrippe (2 kg) durch 2 mit je 10 ml Petroleum getränkte Weichfaserdämmstreifen. |
| 3' 30" | Material brennt mit. |
| 5' | Material im Knie weggebrannt. |
| 6' 30" | Material ist auf 80 cm Höhe weggebrannt , abgefallene Teile brennen auf dem Boden mit. |
| 8' | Material brennt auf dem Boden weiter mit. |
| 15'- 20' | Material brennt auf dem Boden weiter mit. Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0 mm

Das eingesetzte Versuchsmaterial ist vollständig verbrannt.

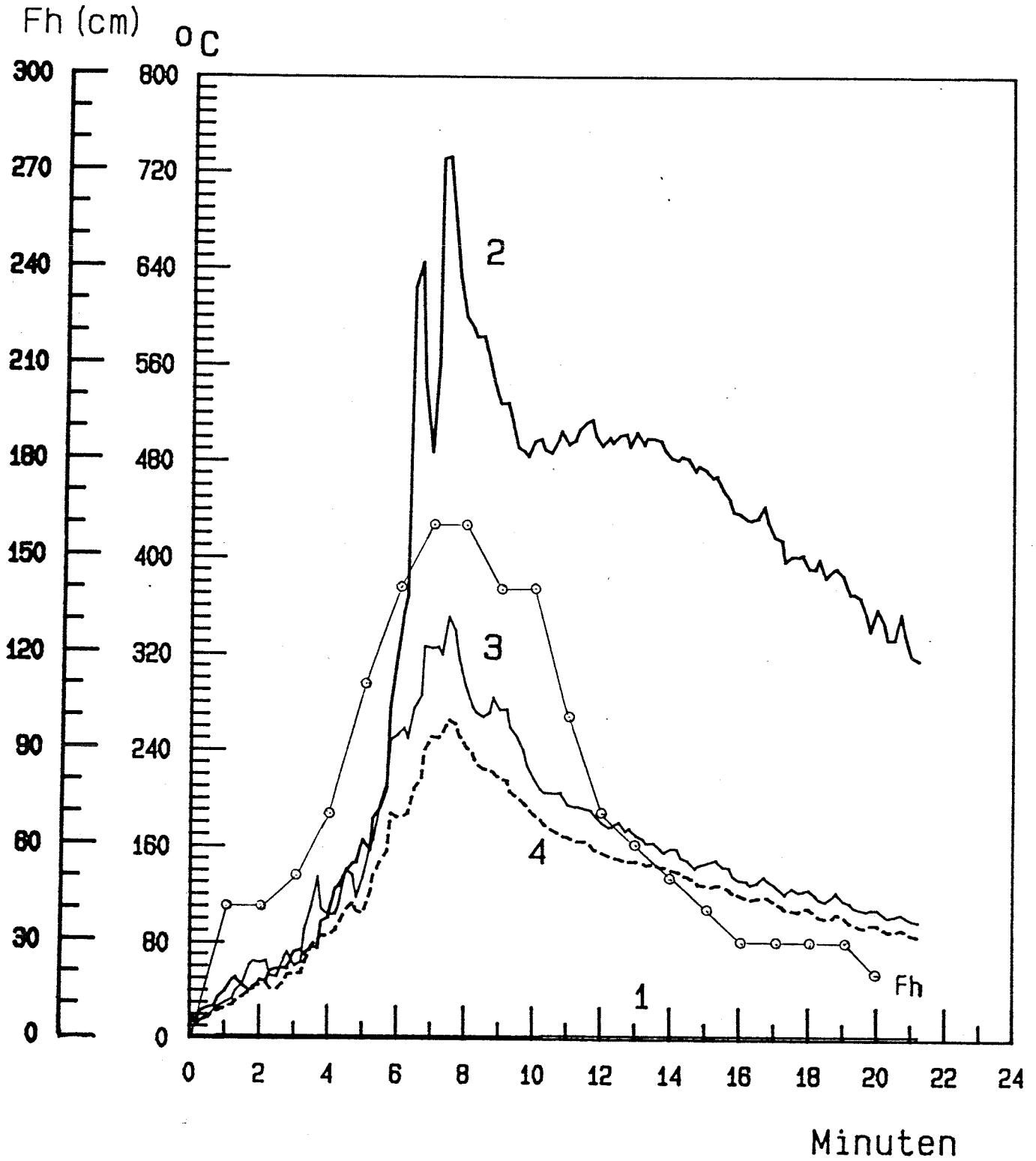
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 2.1 | 17.8 | 14.7 | 16.9 | 11.2 | 11.4 | 11.7 | 11.5 | 12.9 | 13.2 | 14.3 | 13.8 | 15.1 | 15.2 |
| 1.00 | 2.2 | 24.5 | 20.3 | 26.4 | 30.5 | 39.4 | 42.7 | 33.2 | 36.3 | 30.3 | 31.1 | 27.0 | 31.7 | 32.9 |
| 2.00 | 2.3 | 41.9 | 45.0 | 57.9 | 34.3 | 48.9 | 64.6 | 67.5 | 80.8 | 79.4 | 72.6 | 63.9 | 65.3 | 65.1 |
| 3.00 | 2.4 | 52.6 | 47.9 | 64.0 | 53.5 | 72.7 | 95.2 | 92.2 | 90.2 | 77.8 | 70.5 | 64.1 | 62.4 | 62.8 |
| 4.00 | 2.4 | 82.8 | 94.1 | 97.1 | 72.5 | 101.1 | 131.8 | 133.8 | 137.3 | 125.1 | 124.4 | 111.5 | 115.8 | 108.5 |
| 5.00 | 2.4 | 106.3 | 107.1 | 113.6 | 112.6 | 166.2 | 200.1 | 191.4 | 217.5 | 180.4 | 163.9 | 140.5 | 145.3 | 142.0 |
| 6.00 | 2.5 | 184.2 | 352.1 | 233.5 | 201.1 | 316.6 | 346.1 | 339.8 | 334.2 | 316.4 | 294.5 | 263.3 | 274.6 | 265.2 |
| 7.00 | 2.5 | 283.6 | 638.8 | 373.6 | 229.8 | 487.7 | 760.6 | 661.4 | 559.2 | 494.5 | 441.4 | 378.1 | 368.7 | 353.4 |
| 8.00 | 2.6 | 272.3 | 658.8 | 328.6 | 244.3 | 600.8 | 501.8 | 489.7 | 434.0 | 403.5 | 376.0 | 352.4 | 334.3 | 323.1 |
| 9.00 | 2.7 | 244.4 | 429.8 | 251.8 | 255.8 | 528.3 | 449.0 | 429.4 | 397.1 | 373.4 | 344.0 | 322.4 | 308.3 | 291.7 |
| 10.00 | 2.7 | 206.5 | 428.0 | 217.1 | 274.9 | 496.9 | 398.3 | 342.6 | 288.0 | 268.6 | 255.6 | 251.4 | 241.4 | 233.5 |
| 11.00 | 2.8 | 185.7 | 333.8 | 179.7 | 321.3 | 494.3 | 386.0 | 317.3 | 263.8 | 245.8 | 234.9 | 225.8 | 215.0 | 207.6 |
| 12.00 | 3.0 | 171.6 | 321.2 | 165.7 | 423.4 | 493.4 | 396.0 | 311.7 | 244.8 | 218.6 | 205.4 | 201.9 | 194.6 | 188.7 |
| 13.00 | 3.1 | 160.0 | 308.1 | 158.2 | 600.3 | 504.7 | 417.7 | 331.3 | 257.3 | 223.5 | 201.6 | 193.3 | 185.9 | 178.5 |
| 14.00 | 3.0 | 152.6 | 278.7 | 150.5 | 694.6 | 483.1 | 400.7 | 328.2 | 252.5 | 216.7 | 192.2 | 180.5 | 174.6 | 166.5 |
| 15.00 | 3.0 | 141.2 | 263.9 | 136.3 | 746.2 | 472.9 | 402.4 | 304.8 | 221.0 | 186.4 | 172.2 | 165.0 | 160.0 | 154.1 |
| 16.00 | 3.0 | 130.9 | 240.6 | 130.0 | 758.2 | 436.6 | 352.7 | 270.9 | 194.2 | 168.3 | 155.3 | 149.9 | 144.0 | 140.7 |
| 17.00 | 3.1 | 124.2 | 226.6 | 120.7 | 757.2 | 418.0 | 338.3 | 257.9 | 192.5 | 164.7 | 153.7 | 145.2 | 140.7 | 135.3 |
| 18.00 | 3.0 | 117.7 | 213.2 | 113.3 | 750.1 | 391.5 | 319.6 | 248.1 | 191.9 | 163.0 | 151.5 | 140.8 | 138.3 | 130.9 |
| 19.00 | 3.0 | 110.5 | 191.9 | 106.4 | 753.5 | 385.6 | 284.5 | 220.2 | 166.6 | 144.0 | 137.7 | 130.9 | 126.8 | 122.0 |
| 20.00 | 2.9 | 103.2 | 178.6 | 101.6 | 717.7 | 358.1 | 264.1 | 196.8 | 151.4 | 130.8 | 127.4 | 121.8 | 118.8 | 114.6 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 15.2 | 16.8 | 16.9 | 16.7 | 16.9 | 17.4 | 17.1 | 17.7 | 18.0 | 17.8 | 18.5 | 18.6 | 18.3 |
| 1.00 | 29.6 | 31.4 | 31.1 | 29.6 | 29.5 | 31.7 | 28.7 | 30.8 | 30.7 | 29.0 | 31.3 | 31.7 | 29.6 |
| 2.00 | 62.8 | 65.5 | 62.7 | 58.0 | 55.8 | 59.6 | 53.7 | 56.4 | 54.9 | 49.8 | 53.8 | 55.1 | 49.8 |
| 3.00 | 60.7 | 63.1 | 61.6 | 59.5 | 57.7 | 61.3 | 57.4 | 60.6 | 60.8 | 57.9 | 61.3 | 62.7 | 58.2 |
| 4.00 | 103.7 | 105.5 | 103.6 | 99.3 | 97.2 | 103.0 | 95.3 | 99.6 | 98.7 | 92.9 | 98.4 | 100.9 | 93.5 |
| 5.00 | 134.7 | 135.3 | 130.3 | 123.4 | 122.7 | 125.0 | 113.1 | 114.4 | 114.9 | 109.3 | 113.4 | 116.3 | 109.1 |
| 6.00 | 253.2 | 257.9 | 242.1 | 229.3 | 219.3 | 230.0 | 212.3 | 217.9 | 217.8 | 201.8 | 211.5 | 212.6 | 191.2 |
| 7.00 | 324.9 | 338.2 | 317.6 | 302.5 | 285.5 | 294.4 | 269.5 | 276.3 | 274.0 | 253.8 | 269.9 | 273.1 | 249.7 |
| 8.00 | 294.9 | 293.5 | 283.9 | 273.6 | 263.6 | 264.4 | 254.8 | 254.7 | 256.4 | 247.9 | 254.4 | 254.5 | 243.3 |
| 9.00 | 274.1 | 267.2 | 253.5 | 241.6 | 233.7 | 233.1 | 227.8 | 224.5 | 227.2 | 222.0 | 223.0 | 223.5 | 216.0 |
| 10.00 | 217.1 | 203.9 | 199.0 | 193.0 | 191.7 | 187.2 | 191.5 | 185.8 | 191.4 | 191.5 | 188.0 | 188.2 | 186.0 |
| 11.00 | 194.7 | 185.9 | 183.3 | 177.7 | 174.1 | 170.8 | 171.3 | 165.4 | 170.0 | 170.1 | 166.9 | 167.4 | 165.6 |
| 12.00 | 179.9 | 171.4 | 168.7 | 163.1 | 160.7 | 158.1 | 158.0 | 152.5 | 157.0 | 157.1 | 154.3 | 154.3 | 152.0 |
| 13.00 | 169.4 | 163.4 | 160.1 | 154.4 | 150.7 | 149.6 | 149.2 | 145.2 | 148.9 | 148.2 | 148.1 | 147.8 | 146.3 |
| 14.00 | 159.0 | 150.6 | 148.1 | 144.4 | 141.0 | 139.6 | 138.7 | 135.3 | 139.7 | 139.1 | 139.0 | 139.5 | 137.5 |
| 15.00 | 146.4 | 140.5 | 138.2 | 133.5 | 129.9 | 127.5 | 126.9 | 122.3 | 126.7 | 127.0 | 125.6 | 125.4 | 124.2 |
| 16.00 | 132.0 | 125.9 | 124.1 | 122.0 | 118.3 | 116.2 | 118.0 | 114.2 | 119.3 | 119.8 | 118.0 | 117.7 | 116.7 |
| 17.00 | 128.5 | 123.0 | 120.1 | 115.8 | 113.0 | 111.3 | 112.2 | 108.6 | 113.5 | 113.4 | 112.1 | 112.2 | 110.7 |
| 18.00 | 124.9 | 120.2 | 116.9 | 112.8 | 110.3 | 109.4 | 108.5 | 106.0 | 109.8 | 108.4 | 108.6 | 108.9 | 107.2 |
| 19.00 | 115.6 | 110.2 | 108.2 | 104.8 | 102.6 | 101.6 | 101.3 | 98.6 | 101.8 | 101.5 | 100.6 | 100.8 | 99.1 |
| 20.00 | 108.5 | 101.6 | 100.3 | 97.3 | 95.7 | 94.7 | 95.1 | 92.3 | 95.7 | 95.2 | 95.1 | 94.8 | 93.9 |

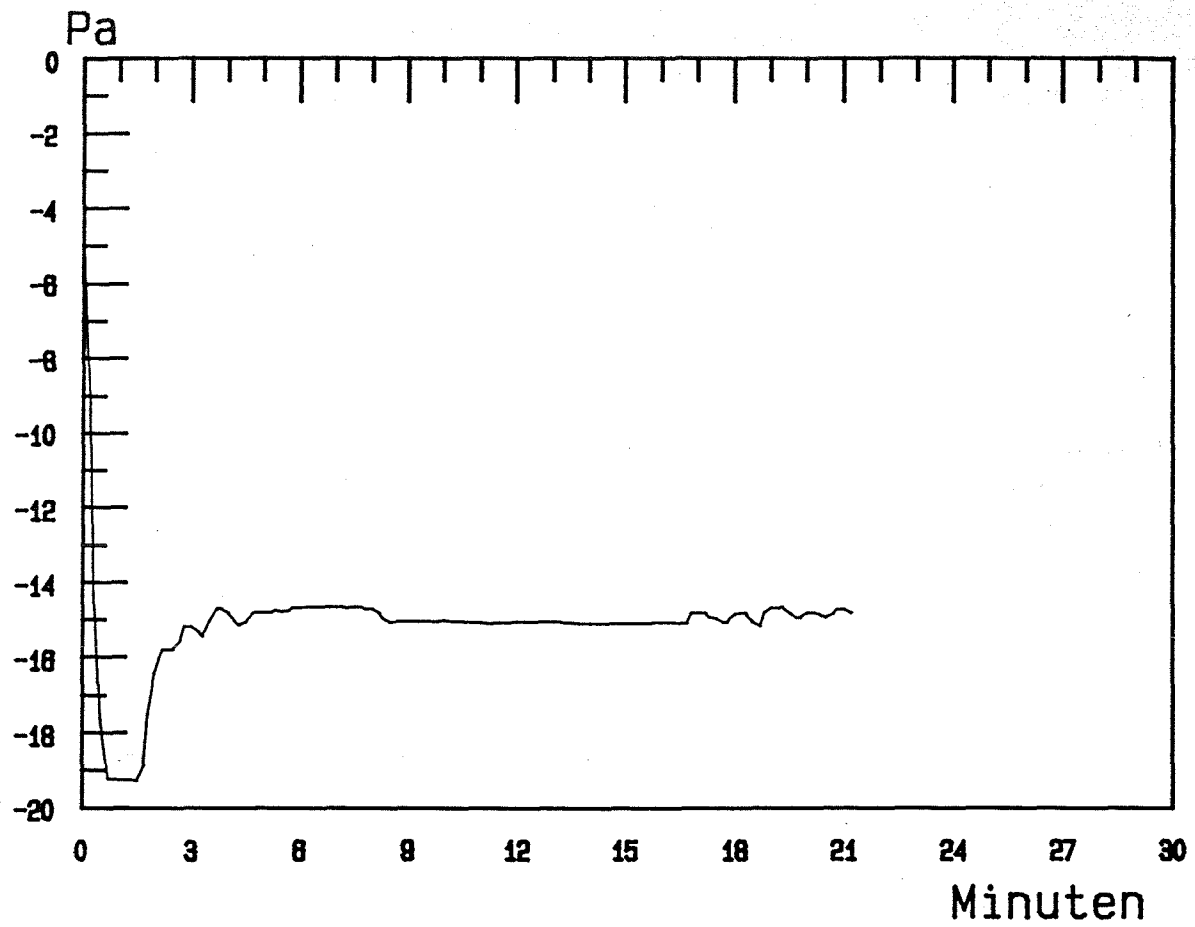
Temperaturen der Meßstellen 1 bis 27 bei Versuch 47.1

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 18.4 | 17.1 | 18.6 |
| 1.00 | 30.6 | 23.0 | 21.7 |
| 2.00 | 53.7 | 39.3 | 41.7 |
| 3.00 | 62.1 | 49.0 | 49.6 |
| 4.00 | 100.9 | 77.8 | 77.6 |
| 5.00 | 114.0 | 104.5 | 95.9 |
| 6.00 | 204.3 | 174.6 | 174.2 |
| 7.00 | 264.5 | 250.3 | 239.6 |
| 8.00 | 248.6 | 244.2 | 237.4 |
| 9.00 | 217.3 | 221.9 | 209.4 |
| 10.00 | 185.5 | 192.6 | 182.6 |
| 11.00 | 165.2 | 173.8 | 163.2 |
| 12.00 | 152.2 | 161.3 | 151.0 |
| 13.00 | 146.8 | 152.3 | 143.8 |
| 14.00 | 138.4 | 145.2 | 136.8 |
| 15.00 | 125.0 | 134.2 | 124.3 |
| 16.00 | 117.0 | 124.7 | 116.0 |
| 17.00 | 111.6 | 118.5 | 109.7 |
| 18.00 | 108.7 | 113.3 | 105.4 |
| 19.00 | 100.0 | 105.7 | 99.5 |
| 20.00 | 94.0 | 98.8 | 93.4 |

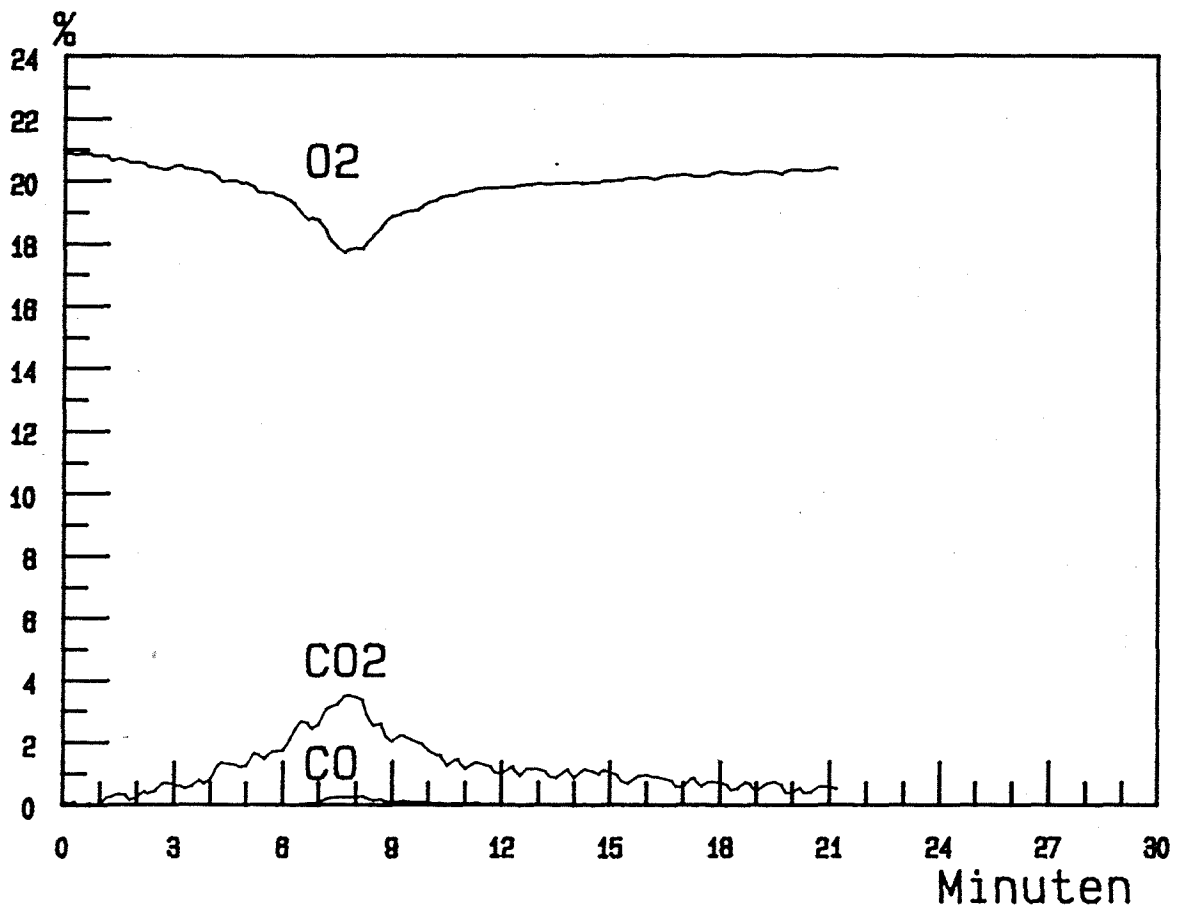
Temperaturen der Meßstellen 28 bis 30 bei Versuch 47.1



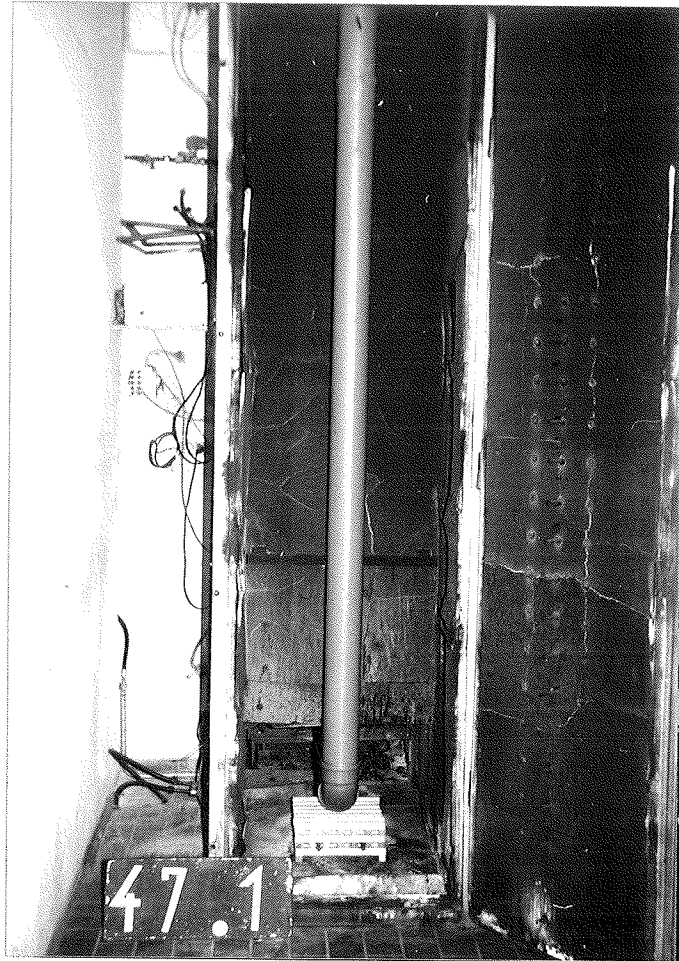
Temperatur und Flammenhoehe bei Versuch 47.1



Druckverlauf im Brandraum bei Versuch 47.1



CO₂, CO, O₂-Gehalt bei Versuch 47.1



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch

Versuch Nr. : 47.2

Materialbeschreibung

Material Nr. 12 : 1 Abwasserrohr
ABS/ASA/PVC

Abmessungen

Innendurchmesser/Außendurchmesser: 106,0 mm/111,0 mm
Zwischenraum zwischen den Proben : -

Beobachtungen während des Brandversuches Nr. 47.2 am 15.03.1988

| Zeit nach Versuchsbeginn | Beobachtungen |
|-----------------------------|--|
| 0' | Zündung des Gasbrenners. |
| 1' | Material brennt im Bereich des Knies mit. |
| 3' 15" | Material im Knie abgefallen und brennt auf dem Boden weiter. |
| 7' | Material bis auf 60 cm von unten weggebrannt. |
| 8' 30" | Material fällt auf den Boden und brennt dort mit. |
| 8'30" - 20' | Abgefallenes Material brennt am Boden weiter. Versuchsende. |

Beobachtungen nach dem Versuch

Restlänge: 0

Das eingesetzte Versuchsmaterial ist bis auf einen 20 cm karbonisierten Rest vollständig zerstört.

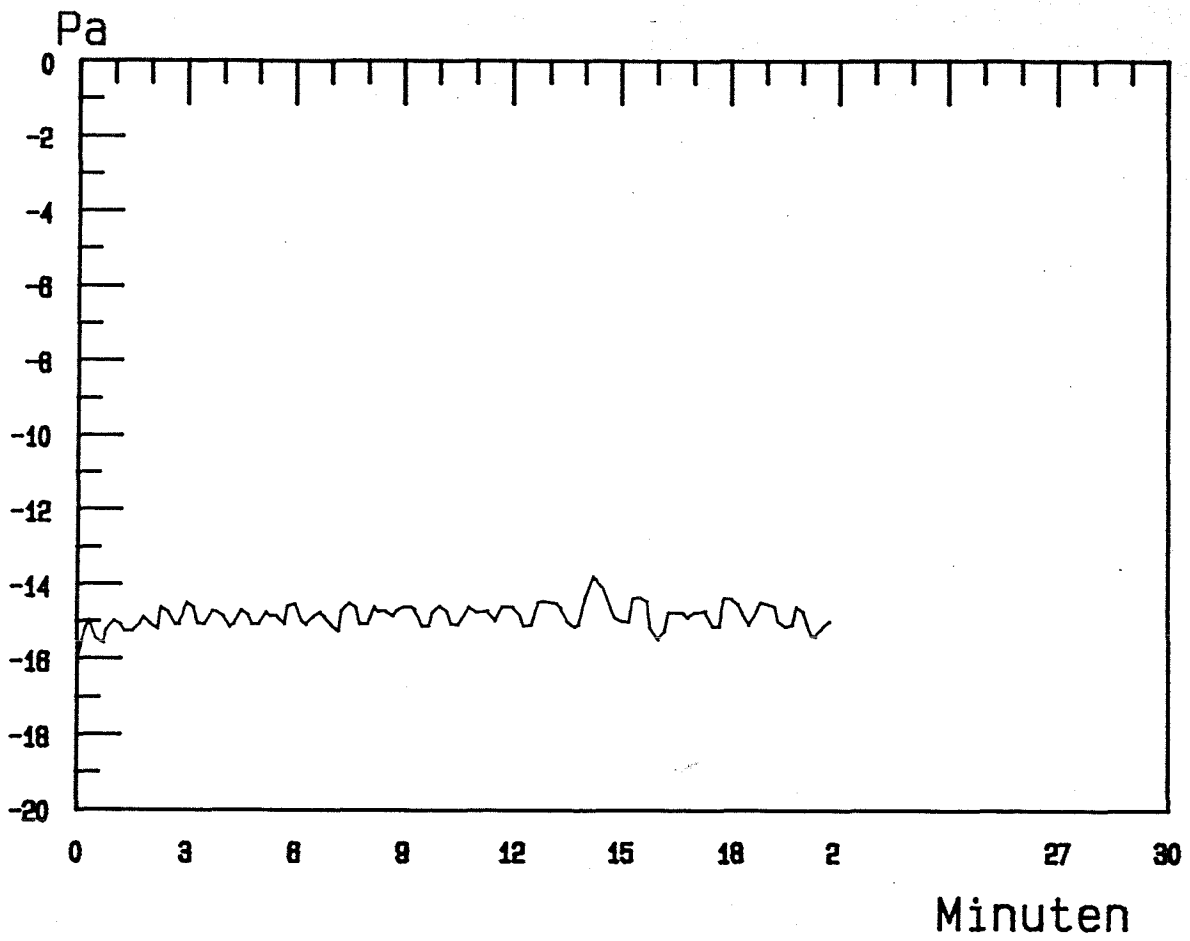
| Zeit/Mst (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 6.8 | 12.4 | 20.6 | 23.0 | 14.4 | 14.6 | 18.3 | 46.8 | 87.6 | 63.5 | 69.2 | 38.3 | 40.9 | 26.6 |
| 1.00 | 6.8 | 71.3 | 84.4 | 108.7 | 42.2 | 56.3 | 91.8 | 116.2 | 131.4 | 158.1 | 155.3 | 131.1 | 138.1 | 107.7 |
| 2.00 | 6.8 | 92.3 | 96.7 | 116.7 | 64.2 | 81.8 | 105.5 | 131.6 | 199.2 | 232.6 | 224.4 | 181.6 | 174.4 | 138.7 |
| 3.00 | 6.8 | 105.4 | 157.3 | 149.7 | 74.2 | 85.0 | 99.0 | 141.5 | 181.7 | 192.7 | 186.7 | 158.6 | 150.3 | 128.5 |
| 4.00 | 6.9 | 104.9 | 142.2 | 136.3 | 79.7 | 107.5 | 156.9 | 179.9 | 176.1 | 168.4 | 168.7 | 150.4 | 144.7 | 128.7 |
| 5.00 | 6.8 | 129.2 | 204.1 | 159.8 | 127.0 | 167.9 | 193.4 | 223.0 | 274.9 | 279.8 | 257.3 | 208.7 | 207.3 | 170.3 |
| 6.00 | 6.9 | 137.0 | 188.3 | 155.1 | 158.6 | 179.0 | 191.1 | 250.5 | 291.8 | 293.2 | 255.3 | 214.9 | 208.0 | 174.2 |
| 7.00 | 6.9 | 132.9 | 207.6 | 137.2 | 159.8 | 189.7 | 218.0 | 254.9 | 234.0 | 225.0 | 206.1 | 187.7 | 177.5 | 158.1 |
| 8.00 | 6.9 | 142.4 | 221.1 | 153.8 | 194.6 | 220.4 | 229.9 | 254.6 | 261.4 | 252.3 | 226.9 | 197.8 | 188.2 | 169.6 |
| 9.00 | 7.0 | 169.4 | 278.3 | 186.1 | 542.0 | 440.0 | 409.9 | 371.0 | 366.2 | 349.5 | 302.5 | 253.0 | 239.3 | 210.5 |
| 10.00 | 7.0 | 175.1 | 304.1 | 196.2 | 480.8 | 419.5 | 379.0 | 354.1 | 324.5 | 298.5 | 266.9 | 239.8 | 226.3 | 205.5 |
| 11.00 | 7.1 | 165.7 | 271.2 | 177.5 | 498.4 | 404.4 | 364.5 | 341.9 | 315.0 | 287.0 | 248.6 | 226.5 | 211.6 | 194.9 |
| 12.00 | 7.1 | 161.2 | 261.9 | 167.8 | 484.3 | 390.2 | 326.5 | 309.0 | 293.6 | 270.3 | 238.9 | 215.3 | 202.1 | 186.3 |
| 13.00 | 7.0 | 170.8 | 274.7 | 181.8 | 435.7 | 387.1 | 327.7 | 306.4 | 285.5 | 267.5 | 240.6 | 220.9 | 208.6 | 193.1 |
| 14.00 | 7.2 | 180.2 | 258.7 | 193.9 | 383.6 | 343.9 | 313.6 | 318.9 | 306.4 | 289.1 | 252.2 | 228.2 | 216.8 | 199.1 |
| 15.00 | 7.2 | 161.4 | 252.3 | 166.3 | 328.5 | 301.1 | 287.2 | 285.2 | 262.6 | 236.7 | 214.1 | 198.4 | 189.5 | 176.1 |
| 16.00 | 7.2 | 158.6 | 239.8 | 176.3 | 267.4 | 268.7 | 254.9 | 262.9 | 250.7 | 241.1 | 225.7 | 204.0 | 199.3 | 183.3 |
| 17.00 | 7.3 | 165.7 | 230.0 | 183.1 | 225.9 | 238.4 | 246.1 | 269.2 | 265.2 | 259.1 | 239.0 | 215.5 | 214.4 | 195.9 |
| 18.00 | 7.3 | 160.9 | 233.9 | 173.3 | 221.2 | 233.0 | 247.0 | 255.5 | 234.1 | 232.0 | 217.4 | 205.2 | 197.0 | 185.1 |
| 19.00 | 7.4 | 156.4 | 226.9 | 162.9 | 219.5 | 236.4 | 243.2 | 253.5 | 238.1 | 229.0 | 221.2 | 204.5 | 202.0 | 183.0 |

| Zeit/Mst (min) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.00 | 46.2 | 28.0 | 33.0 | 31.7 | 28.4 | 30.1 | 26.8 | 26.8 | 23.8 | 22.2 | 27.4 | 22.3 | 21.9 |
| 1.00 | 139.9 | 123.3 | 120.8 | 119.2 | 97.7 | 108.1 | 97.2 | 100.8 | 94.6 | 83.7 | 102.6 | 94.2 | 79.9 |
| 2.00 | 168.8 | 149.3 | 148.7 | 142.6 | 120.0 | 128.0 | 117.3 | 117.7 | 111.8 | 102.0 | 115.6 | 106.5 | 94.0 |
| 3.00 | 149.2 | 135.0 | 136.3 | 131.4 | 116.6 | 122.5 | 114.6 | 115.2 | 113.4 | 105.9 | 118.2 | 111.9 | 102.9 |
| 4.00 | 134.5 | 128.6 | 126.5 | 123.3 | 114.1 | 118.3 | 114.4 | 113.5 | 113.5 | 109.5 | 116.8 | 112.0 | 103.5 |
| 5.00 | 203.7 | 179.1 | 185.3 | 180.5 | 157.9 | 165.8 | 154.1 | 152.6 | 149.3 | 137.4 | 155.0 | 145.3 | 134.1 |
| 6.00 | 191.7 | 177.5 | 174.8 | 168.5 | 150.4 | 158.4 | 149.9 | 147.0 | 148.5 | 140.4 | 150.9 | 145.2 | 134.6 |
| 7.00 | 162.9 | 154.0 | 151.6 | 144.6 | 134.9 | 137.7 | 135.4 | 130.8 | 136.1 | 131.8 | 138.3 | 134.8 | 128.8 |
| 8.00 | 170.9 | 164.1 | 158.6 | 153.1 | 144.5 | 147.9 | 145.1 | 143.1 | 146.0 | 139.6 | 145.9 | 143.2 | 136.6 |
| 9.00 | 217.9 | 209.0 | 204.6 | 194.2 | 179.5 | 185.2 | 175.1 | 172.3 | 175.2 | 164.9 | 178.0 | 175.2 | 161.7 |
| 10.00 | 203.6 | 196.9 | 186.4 | 179.8 | 170.7 | 176.5 | 171.8 | 169.7 | 175.3 | 167.5 | 176.1 | 172.7 | 164.3 |
| 11.00 | 189.5 | 186.7 | 178.6 | 172.1 | 163.0 | 166.7 | 164.1 | 158.2 | 165.6 | 159.8 | 163.8 | 161.9 | 155.6 |
| 12.00 | 184.7 | 178.4 | 175.4 | 169.1 | 160.2 | 161.9 | 158.9 | 153.2 | 160.2 | 156.3 | 160.7 | 159.4 | 153.5 |
| 13.00 | 192.2 | 186.7 | 180.9 | 174.8 | 165.4 | 168.0 | 164.0 | 160.5 | 167.3 | 163.4 | 168.8 | 166.6 | 158.4 |
| 14.00 | 202.4 | 198.3 | 191.3 | 185.0 | 174.9 | 179.8 | 174.7 | 171.9 | 175.4 | 168.0 | 175.1 | 173.0 | 163.0 |
| 15.00 | 171.3 | 167.7 | 163.7 | 157.8 | 152.6 | 155.4 | 154.8 | 150.7 | 157.5 | 154.3 | 157.2 | 155.7 | 151.4 |
| 16.00 | 184.9 | 179.1 | 174.1 | 167.7 | 159.7 | 161.8 | 158.7 | 153.7 | 159.8 | 155.3 | 160.8 | 157.8 | 152.7 |
| 17.00 | 203.2 | 195.9 | 190.3 | 183.3 | 174.0 | 176.7 | 171.5 | 167.5 | 170.2 | 164.5 | 171.6 | 168.0 | 160.9 |
| 18.00 | 185.0 | 183.6 | 176.7 | 170.0 | 162.5 | 164.6 | 161.7 | 156.5 | 163.5 | 159.1 | 162.1 | 160.7 | 153.3 |
| 19.00 | 186.9 | 180.3 | 174.8 | 167.4 | 158.6 | 159.8 | 157.4 | 151.9 | 157.4 | 153.6 | 156.4 | 155.4 | 149.9 |

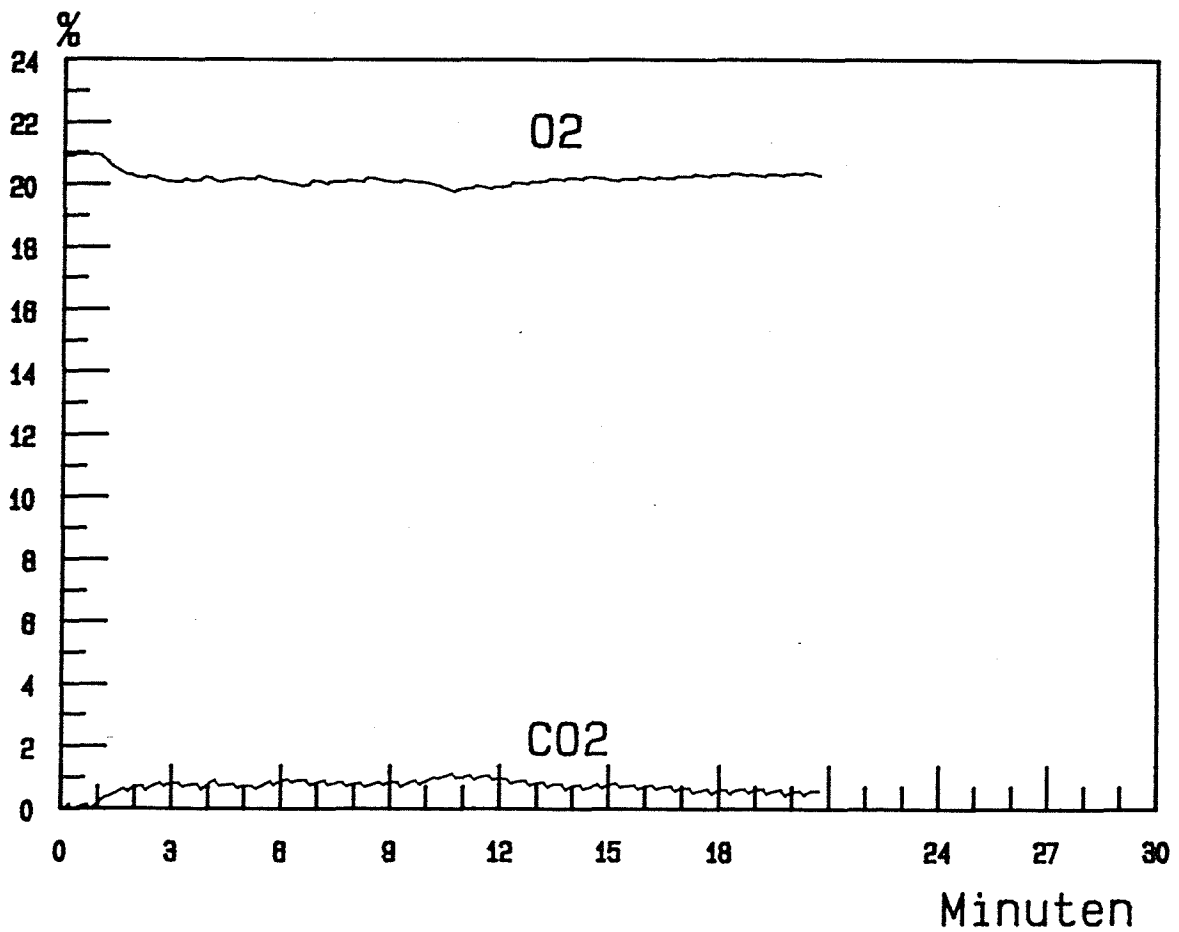
Temperaturen der Meßstellen 1 bis 27 bei Versuch 47.2

| Zeit/Mst (min) | 28 | 29 | 30 |
|-------------------|-------|-------|-------|
| 0.00 | 21.2 | 15.7 | 14.2 |
| 1.00 | 87.1 | 75.8 | 75.7 |
| 2.00 | 100.1 | 88.2 | 91.5 |
| 3.00 | 108.1 | 105.4 | 103.8 |
| 4.00 | 108.0 | 102.7 | 100.9 |
| 5.00 | 139.6 | 129.1 | 122.7 |
| 6.00 | 141.1 | 134.4 | 128.9 |
| 7.00 | 132.0 | 128.5 | 120.6 |
| 8.00 | 141.2 | 139.4 | 131.2 |
| 9.00 | 169.6 | 165.2 | 158.7 |
| 10.00 | 169.4 | 168.0 | 162.8 |
| 11.00 | 159.5 | 158.5 | 154.5 |
| 12.00 | 157.2 | 156.4 | 147.0 |
| 13.00 | 163.2 | 163.3 | 157.4 |
| 14.00 | 168.6 | 172.3 | 167.1 |
| 15.00 | 153.8 | 154.9 | 146.2 |
| 16.00 | 154.7 | 153.0 | 145.1 |
| 17.00 | 164.8 | 161.8 | 156.8 |
| 18.00 | 156.7 | 155.2 | 152.1 |
| 19.00 | 152.8 | 152.0 | 146.7 |

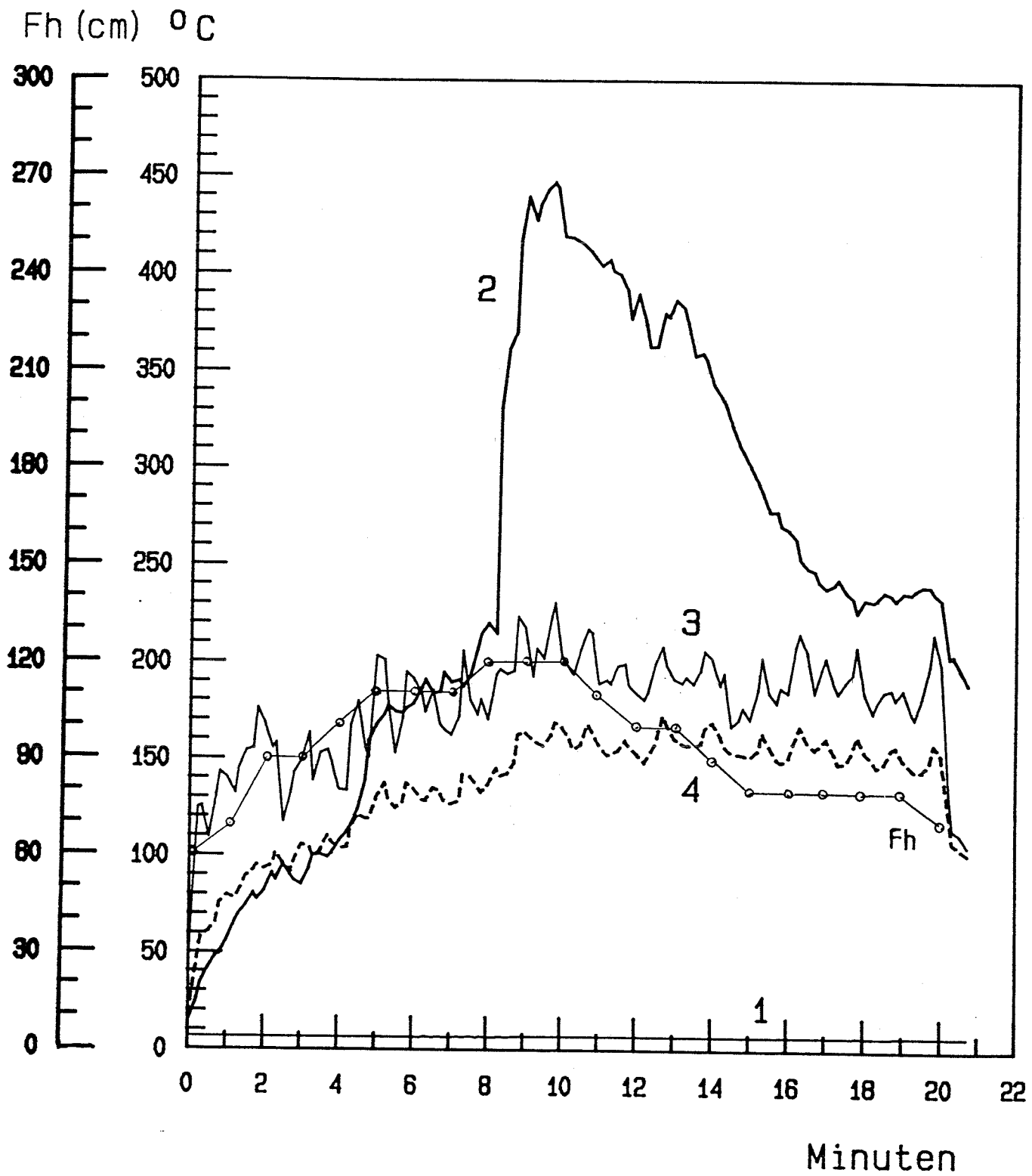
Temperaturen der Meßstellen 28 bis 30 bei Versuch 47.2



Druckverlauf im Brandraum bei Versuch 47.2



CO2, CO, O2-Gehalt bei Versuch 47.2



Temperatur und Flammenhoehe bei Versuch 47.2



Versuchsanordnung vor dem Brandversuch



Versuchsanordnung nach dem Brandversuch