

SUMMARY

F 7081

**Interlaboratory Test to the Long-term Tank Test
According to the DAfStb-Guideline**

Project no. ZP 52-5-20.63-1357/10

In addition to the technical suitability the environmental compatibility of cementitious building materials has to be evaluated before granting a national technical approval. This evaluation is based on the conventions of /DIB08/ that was published by the *Deutsches Institut für Bautechnik* (DIBt). As leaching test the long-term tank test according to the guideline of the *Deutscher Ausschusses für Stahlbeton* (DAfStb), /DAf05/ is used. By order of the DIBt an interlaboratory test was conducted for this leaching procedure in order to determine the scattering within one laboratory and between different laboratories. The details of the test procedure were specified in a coordination meeting at the DIBt. Five laboratories participated. The interlaboratory test was organised and evaluated by the Institute of Building Materials Research of RWTH-Aachen University (ibac). The concrete production was carried out at the Research Institute of the cement Industry (FIZ). Each participant received three concrete cubes with an edge length of 100 mm. The specimens were leached in the different laboratories according to the DAfStb-guideline whereat a temperature of 20 ± 1 °C should be met. The temperature specification was slightly exceeded by two laboratories without significantly influencing the results. The following parameters were analysed: pH-value, electric conductivity, sodium, potassium, calcium, aluminium, sulphate and the trace elements lead, caesium, chromium, copper, nickel, vanadium and zinc. Sodium and potassium showed the smallest scattering with standard deviations below 3 % within one laboratory and a standard deviation of reproducibility below 10 %. These results show the principal suitability of the leaching test. A larger scattering was observed for aluminium, calcium and especially for the trace elements. Also the pH-value and the conductivity scattered. Connections between these parameters are possible. The scattering of the trace elements can also result from a heterogeneous distribution in the concrete or from analytical scattering.

In order to control the chemical analysis a comparison standard solution with low concentrations of lead, chromium and zinc and a comparison elute from the tank test were analysed by all laboratories. The elute was additionally analysed at two other laboratories. In doing so it could be demonstrated that the scattering of the chemical analysis is high and it is a major source of error of the long-term tank test. Some laboratories used the ICP-OES and some used ICP-MS for the analysis of aluminium and the trace elements. The OES has got higher detection limits so that the analysis is imprecise or concentrations lay below the detection limit. The MS is much more sensitive, but in some cases very high values have been determined compared to the ICP-OES. This could be caused by isobaric interferences. The use of a collision cell might be recommendable.

In order to reach a better reproducibility for the pH-values it makes sense to minimise carbonation of the solution. This can be achieved by reduction of the air volume above the elute and by sealing the top cover.

- /DAf05/ Deutscher Ausschuss für Stahlbeton; TA Umwelt: DAfStb-Richtlinie „Bestimmung der Freisetzung anorganischer Stoffe durch Auslaugung aus zementgebundenen Baustoffen“ (Determination of the release of inorganic substances via leaching of cementitious building materials). Ausgabe Mai 2005. Berlin : Deutscher Ausschuss für Stahlbeton
- /DIB08/ Deutsches Institut für Bautechnik: Grundsätze zur Bewertung der Auswirkungen von Bauprodukten auf Boden und Grundwasser – Teil II: Bewertungskonzept für spezielle Bauprodukte – Kapitel: Betonausgangsstoffe und Beton. (Conventions for the evaluation of the influence of building materials on soil and groundwater – Part II, Chapter: Concrete raw materials and concrete). Berlin : Deutsches Institut für Bautechnik, DIBt, 2008. - In: Schriften des Deutschen Instituts für Bautechnik