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Summary: "Emission of environmental-relevant organic substances from concrete with polymer addition" - F 626 - (Az: IV 1-5-849/97)

A possible way, concretes with polymer as addition can influence the environment is the emission of environmental-relevant organic substances. The release of organic substances can take place either by leaching of organic compounds or by the emission of fugitive compounds. Analysing these mechanisms regarding their influence on the environment the behaviour of the concrete during the processing-time and during the lifetime of the building material has to be distinguished.

In this study basic investigations to the subjects mentioned above were carried out. The leaching behaviour and the gaseous emission from concrete with polymer addition were analysed as a function of time. The organic additions which were added to the concretes are a Styrene Acrylate dispersion and a Styrene Butadien dispersion. These are the only organic additions with an approval of conformity by the local government.

The environmental influences caused by the effect of leaching out of organic substances into the environment are mainly relevant in the field of refused water and for concrete pipelines. In this study tank tests were used as practice related test method. The total organic carbon which was found in the leachate is mostly similar to the total organic carbon substances in drinking water. The environmental compatibility of cement based building materials with polymer dispersions used as a concrete addition should be realised for the investigated combinations.

The determination of the emission of volatile organic compounds of with polymer addition cement based building materials were carried out in 1 m³ sized glass-test chambers. The concentration of organic substances in the test chamber air is evaluated directly after the fabrication of the test specimen and after 1, 2, 3, 14, 28 and 42 days. The sampling time for each investigation was 1 hour. During the entire investigation time a decrease of the measured concentration of organic substances in the test chamber air is recorded. It can also be pointed out that the investigation time period (42 days) did not lead to a complete stop of the emission of organic substances by the test specimens. Comparing the test specimens addition of BZS1 (Styrene Acrylate dispersion) and BZS2 (Styrene Butadin dispersion), it becomes clear, that the first one lead to much higher VOC (Volatile organic compounds) values. One reason for this can be depicted in the different concentrations and the quantity of solid material used in the different test specimens. The added amounts of BZS1 and BSZ2 were chosen to meet the maximum allowed values, this resulted in similar properties of both fresh concretes.

An important result of the investigation is, that for both investigated materials the concentration of the emission of volatile organic compounds in the air of the test chambers lies below the MAK-Values (MAK-Values: maximum concentration which are allowed at the place of employment).