

~~Summary of results of the research on an~~ Investigation into the suitability of the rapid test by ammonium oxidation or the use of respiration curves for the assessment of the ecotoxicological effects of construction products on soils~~x~~
(Assessment of the ecotoxicological effects of construction products on soils)

The guideline on the assessment of the effects of construction products on soil and ground water was produced by the German Institute for Structural Engineering/Building Technology (DIBt-Merkblatt zur Bewertung von Bauprodukten auf Boden und Grundwasser; DIBt = Deutsches Institut für Bautechnik) (draft of January 2005) as a basis for assessing the possibility of harmful soil and ground water pollution. The draft guideline provides for a two-stage assessment of construction products. In stage 2 of this concept any mobilizable contents of construction products will be investigated and assessed. Under certain conditions, the third step of stage 2 provides for the investigation of biological parameters and for the corresponding ecotoxicological test methods using eluates of construction products.

Methods of aquatic testing and biodegradability testing were already specified in the guideline. Terrestrial methods are used to ensure that the functioning of the biotope will not be affected by any mobilizable parts of construction materials. The draft guideline mentions the following terrestrial test methods:

- Rapid test by ammonium oxidation (DIN/ISO 15685) and
- Soil respiration curves (DIN/ISO 17155).

A first project had already established the suitability of these two test methods. The aim of the present research project was to validate these methods on two further soils, to propose an adequate test soil, and to interpret the results with a view to developing a series of ecotoxicological tests for certain groups of products.

The construction materials tested were a soil injection agent on an acrylate basis and an agent for the sanitation of sewage pipes. The products were eluted by means of column elution according to the SCHOESSNER method at the Gelsenkirchen Institute for Hygiene (Hygieneinstitut Gelsenkirchen). This time a slightly humous and a strongly humous sandy soil were chosen as test soils.

A total of four construction material eluates were produced (two construction materials each from the TOC maximum and the TOC decrease stage). The two soils were incubated with the eluates.

Both terrestrial test methods were used on the above-mentioned soils after a one-week and a twelve-week incubation period in comparison to the control soil and with four parallels at the Berlin Technical University, Institute for Ecology, Landscaping and Refuse Burden on the Landscape (TU Berlin, Institut für Ökologie, Landschaftsbau und Abfallbelastung der Landschaft). To facilitate a comparison of the respective results of these aquatic and terrestrial test methods and to examine the suitability of these procedures, the following parallel tests were carried out at the Fraunhofer Institute for Molecular Biology and Applied Ecology (Fraunhofer-Institut für Molekularbiologie und Angewandte Ökologie):

- Luminescent bacteria test (DIN EN ISO 11348),
- Degradability test (OECD screening test 301 E)

The following conclusions can be drawn as a result of the research project:

1. The test results of the first project were confirmed to a very large extent by tests on two further soils.
2. Both terrestrial test methods exhibit a high sensitivity in assessing the effects of products from the tested group of building materials on the terrestrial environment. Whereas the nitrification test demonstrates the impact on a very sensitive, but extremely important group of specialised microorganisms, the respiration test gives information on the general effect on the biological activity of the soil microflora.
3. The tests have to be done after an incubation period of 7 and 100 days. Only the results obtained after an incubation time of 100 days should be used for assessment.
4. The overall effects were greatest in the two sandy soils. Accordingly a test soil of the REFESOL-category 01 A was recommended as the standard test soil.
5. The necessity of using terrestrial methods as well as aquatic ones was confirmed. Once again, it became obvious that a series of tests consisting of a number of test organisms and parameters will considerably improve the chances of detecting any toxic effects.
6. In general, the OECD screening test is also suitable for investigating the biodegradability of eluates. However, it is not possible to differentiate between the substances in the admixtures, and thus an accumulation of substances in the soil cannot be ruled out. It is recommended to perform the degradation test in both the aquatic and the terrestrial environments.
7. The suitability of the luminescent bacteria test for testing eluates of construction products was confirmed.
8. Assessment standards for the terrestrial ecological toxicity by construction products were developed and proposed.
9. On the whole, the results of the two research projects are not yet sufficient for these assessment standards for soils to be included without restrictions in the DIBt guidelines ("Bewertung der Auswirkungen von Bauprodukten auf Boden und Grundwasser", part 2 "Bodeninjektionsmittel und Kanalrohrsaniierungsmittel"). Both soil tests should be performed using further soil injection agents and the above-mentioned soils; during this process, the developed assessment standards should be re-examined.