

Estimation of the longterm mobility of heavy metals/metalloids by pH-Stat-Elution from bricks made of harbour dredging sludge

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In the ports of Bremen an annual amount of 700,000 m³ of sludge is dredged. After drainage of the material are still 200,000 m³ sediment remaining. Due to its contents of organic and inorganic contaminants, it has to be deposited on a separate harbour sludge dumpsite.

Within the framework of a regional research program the Department of Earth Sciences at the University of Bremen investigates alternative strategies to manage the harbour sludge problem. According to German quality standards the contamination in the sludge allows the utilization as a raw material for brick production. Experience in manufacturing bricks with other harbour sediments showed, German constructional standards are fulfilled. Therefore our research was focussed especially on ecological longterm effects in using harbour sludge as brick material.

A main focus of the investigations is the longterm mobility of heavy metals and metalloids from sludge-bricks under various geochemical conditions. The pH represents the main master variable. Depending on the acid/base neutralizing capacity of the brick, the pH will be in the range of pH 4–11. Low pH values are typical for rainwater runoff whereas high pH values are characteristic for seepage waters from rubble

dumps. Further variables are the specific inner surface of the bricks and the buffering capacity of the surrounding strata. The mobility of heavy metals and metalloids should be higher in a weakly buffered system with a large surface (e.g. brick-sand as covering for tennis courts) than in a strongly buffered system with a smaller surface (e.g. brick-wall).

In order to estimate the longterm mobility of heavy metals/metalloids from building materials a method discussed is the pH-Stat-Elution. In a typical pH-Stat-Elution a brick sample is leached for a period of 24h under constant pH-conditions. Subsequently concentrations of heavy metals/metalloids in the solution are analysed. Together with the acid/base neutralizing capacity as a parameter for the potential, that a defined pH value will occur, the longterm mobility of heavy metals/metalloids may be estimated.

First results indicate that for the most elements with exception for As no mobilisation of heavy metals above natural background concentrations occurs. Mobilisation remained low with increasing pH-values up to 11. Increasing mobilisation was observed at decreasing pH-values. Compared with other commercially available bricks the harbour sludge bricks show no disadvantage due to mobilisation of heavy metals/metalloids.