Mobility of Cd in soils fertilized with sewage sludge containing Cd pigments

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Cd sulfide and selenide pigments have been used for artists' paints due to their lightfastness, opacity and tinting strength for more than 200 years. More recently they raised concern if their usage may pose a risk to the environment. The pigments are possibly introduced into waste water and subsequently to sewage sludge after cleaning of used brushes with water. Since sewage sludge is often applied as fertilizer in agriculture the pigments may be transferred to agricultural soils. If mobilized, they may be transported to groundwater and be introduced in the human food chain after up take by plants. This raises the question if the usage of these pigments should be banned according to annex XV of the REACH regulations.

Cd sulfide is hardly soluble, but may be mobile in soils in oxidizing or acidic conditions, which results in free Cd ions. Column percolation tests in laboratory scale are a good comprosise between effort and gained information in view of simulating realistic environmental conditons.

The results of such percolation test under different redox conditions are presented. As test materials soils containing different amounts of organic matter were mixed with sewage slude spiked with Cd pigments.The columns were filled and percolated in up-flow direction using artificial rain water. The redox potential was measured on-line directly at the column outflow. All other parameters as pH-value, condutivity, turbitidy, DOC concentration and Cd concentration were measured in the collected eluates. The total Cd content in solid matter was determined by aqua regia digestion and subsequent ICP-OES analysis.

The observed release of Cd increases with increasing redoxpotential, but even for the most oxidizing conditions no more than 1 % of the Cd is mobilized. Taking into account that approx. 0.14 % of the Cd introduced to agricultural soils originates from pigments, while mineral fertilizer is the most important source, the ban of usage of this pigments would have only negligible effect on soil quality.