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Effect of Natural Abiotic Colloids on the Transport of Lindane (gamma-hexachlorocyclohexane) through Saturated Porous Media: Laboratory Experiments and Model-Based Analysis

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In many developing countries, the hygienic situation has improved by changing from surface-water bodies to groundwater as drinking water resource. However, failures have frequently been reported, presumably caused by wrong design of groundwater extraction (e.g., wells too close to open-water bodies, landfill leachates or agricultural areas). Moreover threat to groundwater pollution is enhanced when colloidal particles in the subsurface can act as carriers for adsorbing contaminants such as hydrophobic chlorinated organic contaminants.
In this study, the main objective was to investigate the influence of particles in the size range of colloids on the subsurface transport of pesticides which are known to cause severe health problems. The model pesticide was gamma-hexachlorocyclohexane, a representative hydrophobic insecticide which is still used mainly in tropical countries. Colloid-facilitated transport was carried out by considering a first case where the adsorption of the contaminant to the particles is at equilibrium before getting simultaneously transported, and a second case where this equilibrium was not reached before their transport. Another focus besides colloid-facilitated transport was placed on the release of the contaminant from trapped colloids. Data analysis was done with the help of numerical modeling and the minimum model complexity needed to simulate such transports was examined.