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Desorption of Polycyclic Aromatic Hydrocarbons (PAHs) from heterogeneous geosorbents

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A high concentration of PAH (about 70mg/kg) was found in Mosel River sediments, which were associated with a large quantity of coal particles. Mobilisation of PAH from these sediments could cause environmental problems. The objectives of this study are: (1) to characterize the PAH desorption from Mosel river sediments; (2) to find the dominant geosorbents and to determine their physical and chemical characteristics; (3) to elucidate the desorption mechanism of PAH in study area.

Heterogeneous geosorbents in sediments show widely varying PAH concentrations and binding capacities. Organic carbon (OC) is thought to be the dominant geosorbent for PAH when present in concentrations above about 0.1% of natural soil/sediment (Johnson et al., 2001). The three main OCs are considered to be humic substances, geopolymers (kerogens and coals) and combustion/pyrolysis forms (black carbon) with different sorption/desorption characteristics (Allen-King et al., 2002). “Soft carbon”, consisting of fulvic acids and humic acids in their rubbery state, and “hard carbon”, including kerogen, black carbon and humic acids in their glassy state, were defined by Weber (1992) in relation to their different physical chemical characteristics. However, due to the complexity of natural sediments, the true mechanism of PAH desorption is presently still unclear. Experiments with synthesis material, the possible alteration of geosorbents by improper treatments and experimental artefacts make the presently hypothesises, such as desorption mechanism under question. Above all, identification and quantification of these geosorbents, including black carbon associated with sediments, is the key to elucidate sorption/desorption mechanism.

In this project, physical separation, instead of chemical, is chosen in order to minimize

the alteration of geosorbents. Sediments are separated according to the grain size and density. Thus, several fractions (organic and inorganic domains, sand, silt and clay) are separated. 16 EPA PAH are determined in each separated fraction and original sediments, respectively. In addition, batch experiments are performed with separated as well as original sediments. Furthermore, microscopic investigation and elemental analysis are used to get information of the chemical composition and physical characteristics of different fractions, which contribute to elucidate the mechanism of PAH desorption from sediments.

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