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Remediation and desorption kinetics of pyrene from kaolinite co-contaminated with heavy metals at various organic matter contents

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Soils co-contaminated with polycyclic aromatic hydrocarbons (PAHs) and heavy metals are challenging for remediation. In the present study desorption of pyrene in kaolinite, co-contaminated by Ni, Pb and Zn, was examined by combinations of surfactants and chelating agents such as Triton X-100, Tween 80, Ethylene diamine tetra acetic acid (EDTA) and citric acid. Results showed that a combination of Triton X-100 (7.5 % w/w) + EDTA (0.01 M) and Tween 80 (7.5 % w/w) + EDTA (0.01 M) were effective in simultaneously desorbing both types of contaminants. Batch desorption tests were conducted using single and combined enhancing agents containing Triton X-100 and Tween 80 as non-ionic surfactants, EDTA as a chelating agent, and citric acid as an organic acid. The solution with the highest removal efficiency was the combined solution containing Triton X-100 (7.5 % w/w) + EDTA (0.01M). Triton X-100 (7.5% w/w) + EDTA (0.01M) led to removal efficiencies of 88% for pyrene in base kaolinite. Batch desorption kinetic experiments were performed using Triton X-100 (7.5% w/w) + EDTA (0.01M). During the first 24 h, desorption was rapid. Organic matter content in the kaolinite led to a reduction in the desorption rate of the contaminants. The desorption kinetic data were well fitted by a pseudo-second-order kinetic model.