

Kinetics of redox reactions of Pu(V) in solutions containing different fractions of humic substances

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Humic substances (HS) play an important role in speciation of actinides in the environment due to complexing, redox and sorptive interactions. Actual work is devoted to plutonium speciation studying on hematite (α -Fe₂O₃) -natural water interface with presence of humic substances.

Sorption of Pu(V) onto low-temperature hematite was studied in presence of natural occurring and synthetic humic acid (HA) under different concentration of HA. Sorption was carried out at pH 6.0 – 6.1 in 0.01M NH₄ClO₄ (as a background electrolyte) and at range of HA concentration from 57.0 to 0.57 ppm. It was shown by solvent extraction method that all Pu adsorbed onto hematite surface in presence of HA posed as Pu(IV).

To study the reduction of Pu(V) by natural occurring HS was humic and fulvic acids (FA) were eluted from sod-podzol and chernozem soils sampled near PA “Mayak” (Russia) using conventional method and separated to fractions depending on their nature (FA or HA), solubility and affinity to mineral part of soil. Obtained fractions of humic substances then were separated by molecular size for more detail studying of their reducing ability. Kinetic curves were obtained for each fraction and compared with results obtained for synthetic HS.

On the base of curve slope, reducing ability is increased in order: HA < FA < low molecular size fraction.

Obtained data show that different HS can play different parts in Pu(V) migration ability due to different reducing and complexing properties that allow to estimate influence of different HS to actinides behavior in actual geological system (prevention or promotion their sorption on minerals and clays).

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