

# Interaction of Pu(V,VI) with TiO<sub>2</sub>: Role of photocatalytic properties on redox reaction

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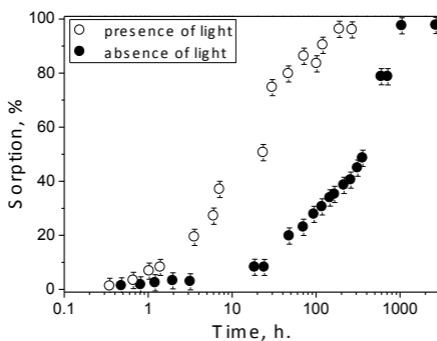
Sorption is one of the most important processes which control behaviour of plutonium in the environment. Previously it was demonstrated that redox reactions occur upon plutonium sorption onto different minerals. In most cases Pu(IV) is stabilized on solid phases even for redox-inactive minerals.

Interaction of Pu(V,VI) with TiO<sub>2</sub> has been studied in this work. TiO<sub>2</sub> is one of the widespread minerals that demonstrates high sorption of various cation.

The sorption was studied by combination of batch experiments and spectroscopic techniques, including XAFS and HRTEM. Influence of light onto plutonium speciation was studied.

It was clearly demonstrated that light has strong influence on Pu(V,VI) sorption onto TiO<sub>2</sub>. Kinetics of Pu(V,VI) is much faster when suspension is exposed to light (fig.1) that could be explained by the photocatalytic activities of TiO<sub>2</sub> that produce electrons which are needed for redox reaction. It was also observed that light effects on kinetics of leaching behavior of Pu from TiO<sub>2</sub> surface after sorption.

EXAFS data approve that Pu(IV) is stabilized onto TiO<sub>2</sub>. No large difference in EXAFS spectra of Pu(V,VI) sorbed onto TiO<sub>2</sub> in the presence and absence of light was observed. XAFS and HRTEM shows that PuO<sub>2</sub>-like structure is formed onto TiO<sub>2</sub> surface.



**Figure 1:** Kinetics of Pu(V,VI) sorption onto TiO<sub>2</sub> ([Pu(V,VI)] = 2·10<sup>-8</sup>M, [TiO<sub>2</sub>] = 12 mg/L, pH = 4.1).

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