

Plutonium interactions with pure and substituted iron and manganese oxyhydroxide minerals

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Due to its long half live ²³⁹-Pu is a major concern for radioactive contaminated sites and risk assessment of high-level geologic nuclear waste repositories. Plutonium can co-exist in four stable oxidation states [Pu³⁺, Pu⁴⁺, Pu(V)O₂⁺, and Pu(VI)O₂²⁺] under environmental conditions. Solubility and speciation can vary widely depending on oxidation state and ultimately affect the transport properties. Oxidized plutonium is orders of magnitude more soluble than the reduced forms, Pu(III) and Pu(IV), and thus Pu(V) and Pu(VI) are more mobile in the environment. Plutonium is highly redox active; contact with the surrounding environment could potentially reduce the more soluble forms of plutonium, causing them to become more insoluble.

We studied the interaction iron oxyhydroxide minerals (ferrihydrite and goethite), as environmentally prevalent mineral phases with hexavalent plutonium. XAS analysis for the sorption of Pu(VI) to pure goethite, showed that Pu(VI) was reduced to Pu(V).

We also investigated the interaction of Pu(VI) with pure manganese oxyhydroxide minerals manganite (MnOOH) and hausmannite (Mn₃O₄). These are minor minerals that have been shown to be present at many current and potential geologic nuclear storage sites as coatings on iron minerals. XANES measurements showed that upon contact with the minerals, all the plutonium sorbed to the minerals was reduced to either Pu(V) or Pu(IV). Fits to the EXAFS imply that the Pu is sorbed to the manganite and hausmannite surfaces in an inner-sphere coordination.

We also studied the influence of manganese as a minor component with synthetic manganese-substituted goethite. Pu(VI) was reduced to Pu(V) or Pu(IV) upon contact with the mineral. The results suggest that manganese is the species responsible for the reduction of Pu(VI) to the more insoluble Pu(IV) oxidation state, and indicate the possibility of limited plutonium migration in the environment through interaction with Mn-containing minerals

Influence of oil price fluctuation to Chinese Economy

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Research aiming at relation between oil price and economic activities dated back to 1970's when economic depression happened in main oil consuming countries because of twice oil crisis. However, initial research took energy economy as one part of resources & environmental economics, afterwards research emphasis gradually turned to aspects such as how government policies affect energy consumption and improve efficiency of energy utilization. In recent years, by establishing models, each research conducted analysis, measurement and predict of affection to economic activity index by oil price fluctuation [1]. Research results indicate that large fluctuation of crude oil price caused a certain affects to OECD countries [2].

From the turn of this century up to the present, dramatic rise of oil price has caused a certain affect to Chinese economic operation. By following oil consumption material flow and value chain analysis principle, we have established oil price fluctuation and micro-economic growth related analysis model. We also calculated relative industrial departments oil consumption coefficient. We formed a model of affect by international oil price fluctuation to Chinese economy, overcoming shortage of previous research. We conducted sensitivity analysis and projection about oil price fluctuation affecting Chinese economy, providing scientific evidence to the nation for formulating early warning mechanism on guarding against oil price risk.

[1] George Filis (2010) *Energy Economics* (2010) **32**, 877–886. [2] Fabio Milani (2009) *Energy Economics* (2009) **31**, 827–837.