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Isotopic-ratio Studies on the Redox Chemistry and Mobility of Uranium in a Phosphogypsum Disposal Site

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The present study aims to assess the effect of redox conditions existing within a phosphogypsum disposal site on the redox stability and mobility of uranium in the disposed material. Phosphogypsum sampling and in-situ measurements were carried out at a coastal stack in Vasiliko, Cyprus. pH, EH and solubility experiments were performed in-situ and in laboratory systems. Generally, in the open stack oxidizing conditions predominate stabilizing uranium in its hexavalent oxidation state. On the other hand, after the application of a soil/vegetative cover and in the presence of natural organic matter, anoxic conditions prevail ($EH < -70$ mV) enabling U(VI) reduction to U(IV). Uranium concentration measurements as well as $^{230}\text{Th}/^{238}\text{U}$ ratios show higher uranium retention under anoxic conditions, which could be ascribed to the lower solubility and mobility of U(IV).

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