Deliquescence relative humidity and characterization of dusts from the vicinity of Yucca Mountain, Nevada

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Evaporation of seepage water and deposition of rock and atmospheric dusts through the drift ventilation system may form a salt layer on the surfaces of waste packages and drip shields in the potential radioactive waste geologic repository at Yucca Mountain, Nevada. These salts, if deliquescent, could absorb moisture from the air and form potentially corrosive brines if exposed to humidity levels above their mutual deliquescence relative humidity (DRH). In this study, the DRH of the soluble fraction of dust samples taken from the Exploratory Studies Facility and the Yucca Mountain vicinity were measured. DRH was determined by measuring the conductivities of the salt fraction in a humidity chamber, where DRH is determined by the relative humidity at which conductivity undergoes a marked increase. The dusts were also characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM). Initial results show that the soluble salt fraction is less than 20% of the bulk weight of dust and does not display significant deliquescence behavior.

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Building conceptual process models of field scale uranium reactive transport for the Hanford 300 Area

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This paper describes the use of subsurface simulation to build, test, and couple conceptual process models describing uranium transport and fate at the Hanford 300 Area in Washington State. At this site, uranium-contaminated sediments in the vadose zone and aquifer are subject to significant variations in water levels and velocities driven by the hourly time scale of the Columbia River stage dynamics. In the aquifer, mixing of the dilute solution chemistry of the river with the groundwater complicates the uranium sorption behavior as the mobility of U(VI) in these sediments has been shown to be a function of pH and concentrations of carbonate, calcium, and uranium. The small time scales of transport resulting from the diurnal river stage fluctuations and the highly transmissive sediments (hydraulic conductivities ~1500 m/d) bring into play sorption reaction kinetics that would be less important under more typical groundwater time scales. One--dimensional simulations of uranium reactive transport, based on laboratory-derived models of multirate kinetic sorption and equilibrium multicomponent surface complexation, were used to assess recharge-driven uranium transport in the vadose zone and changes to uranium mobility due to incursions of river water into the aquifer. An integrated system of these coupled processes is currently being addressed with a two-dimensional vertical cross-sectional simulation of saturated-unsaturated flow and reactive transport that is driven by hourly changes in river and aquifer water levels.