STUDIES OF RADIONUCLIDE TRANSPORT IN DOLOMITE FROM THE WASTE ISOLATION PILOT PLANT IN SOUTHEASTERN NEW MEXICO, USA.

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The Waste Isolation Pilot Plant (WIPP) is designed for the geologic disposal of transuranic wastes generated by US weapons production. Tracer tests conducted in the Culebra dolomite, a potential groundwater pathway, suggested that a multirate mass transfer model provides the best description of conservative tracer transport for length scales of several to tens of meters. This paper describes independent characterization of the chemical and physical components of actinide retardation; such deconvolution is required to support application of a multirate model to radionuclide transport at the scale of the WIPP site. Transport experiments with 22Na and 232U/238U, using crushed dolomite with different size fractions, have been run at multiple flow rates to constrain intraparticle diffusion rates and aggregate retardation capacity coefficients. Flow-interruption experiments have been carried out with intact cores of fractured dolomite whose pore structures have been characterized with computerized gamma-ray tomography. When advective flow is temporarily interrupted during the experiments, only diffusion occurs in the system and the mass transfer coefficient describing local solute transfer between the advective pore space (fractures) and the non-mobile porosity (matrix) can be measured accurately. Batch experiments are being carried out to determine the dependence of actinide sorption and desorption coefficients on reaction rates, tracer concentrations, and compositions of solution and substrates in the absence of transport. Once an internally-consistent set of chemical and physical parameters is obtained, numerical sensitivity analysis with a mechanistically-based chemical-flow-transport model can examine the effects of key parameter variations on radionuclide transport and allow model simplification for performance assessment.