

Understanding redox chemistry of UO₂ in a deep geological repository

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Understanding which processes control the redox states in a waste package in case of technical barrier failure in a deep geological repository is crucial for the safe disposal of nuclear waste. The redox potential formed within the failed canister will depend on the buffer capacity of each of these pairs, and kinetic restrictions, which are still poorly understood. At the same time, this redox potential is a crucial parameter controlling aqueous mobility of uranium and many redox sensitive fission products, such as iodine and technetium. Thus, understanding of these redox state controls is required for the evaluation and mitigation of consequences of potential waste container failure. Via high temperature, high pressure experiments of UO₂ in the presence of Zircaloy and waste container material in synthetic ground water baseline data of evolving redox potentials and the solubility of engineered barriers will be derived. First experimental results of this collaborative project between the University of California, Los Alamos National Laboratory and Oak Ridge National Laboratory will be presented.