

SECTION A. Project Title: Effects of Mineral Impurities and Heat on Uranium (VI) Sorption onto Bentonite – California State University East Bay**SECTION B. Project Description**

California State University East Bay, in collaboration with Lawrence Berkeley National Laboratory (LBNL) and Los Alamos National Laboratory proposes to investigate the impacts of calcium carbonate (calcite) impurities on uranium (VI) sorption onto sodium-montmorillonite, the primary mineralogical component in bentonite, before and after the exposure of mineral phases to heat.

The research tasks include:

- Uranium (VI) sorption experiments with synthetic Na-montmorillonite-calcite mixtures and heterogeneous bentonite samples from the 2nd dismantling phase of the FEBEX heater test
- Characterization of U(VI) surface speciation with uranium EXAFS spectroscopy
- Uranium(VI) diffusion experiments with synthetic Na-montmorillonite-calcite mixtures
- MD simulations of montmorillonite swelling behavior and basal d-spacings of montmorillonite nanopores controlling the possible diffusion of U(VI) into nanopores
- Expansion and calibration of an existing U(VI)- montmorillonite SCM to include calcite impurity and heat effects, followed by the coupling of this new SCM to a U(VI) diffusion model.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use/Radioactive Waste Generation – Small quantities (<20 g) of uranium-bearing material will be shipped using approved protocols to National Laboratories for measurement via synchrotron radiation-based techniques. All procedures for material handling and disposal will be approved by the Environmental Health and Safety departments at all sites, and work will be conducted according to approved procedures. Additionally, U-238 and /or U-233 will be used during sorption experiments. Total tracer amounts are estimated at 50 microCi or less for U-233 and 1 microCi or less for U-238. The radioactive tracer use and waste generation will be authorized under a Radioactive Materials License under the State of California.

LBNL will use tritiated water (H-3) and U-233 as radioactive tracers during the diffusion experiments. Total tracer amounts used will be approximately 20 microCuries for H-3 and 5 microCuries for U-233. Radioactive tracer use and waste generation are covered under existing radioactive work authorization.

Chemical Use/Storage / Hazardous Waste Generation – Chemicals used for this work include lab grade salts of low hazard and dilute (<5%) acids. Quantities used will be less than 20 L. Hazardous waste generated will be < 6 gallons of dilute acid (2% nitric and hydrochloric acids). This waste will be disposed of using the existing Hazardous Waste Generation system at California State University East Bay. LBNL will use lab grade salts of low hazard and dilute (< 5%) acids. Quantities used will be less than 5 L. Hazardous waste generated will be < 5 gallons of dilute acid (2% nitric and hydrochloric acids). This waste will be disposed of using the existing Hazardous Waste Generation system at LBNL.

SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s): Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.

Note: For Categorical Exclusions (CXs) the proposed action must not: 1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, including requirements of DOE orders; 2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities; 3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; 4) adversely affect environmentally sensitive resources. In addition, no extraordinary circumstances related to the proposal exist which would affect the significance of the action, and the action is not “connected” nor “related” (40 CFR 1508.25(a)(1) and (2), respectively) to other actions with potentially or cumulatively significant impacts.

References: B3.6 Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial development.

Justification: The activity consists of university-scale research aimed at investigating the impacts of calcium carbonate (calcite) impurities on uranium (VI) sorption onto sodium-montmorillonite before and after the exposure of mineral phases to heat.

DOE-ID NEPA CX DETERMINATION

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) Yes No

Approved by Jason Sturm, DOE-ID NEPA Compliance Officer, on 6/28/2017