## Title

Defining the interactions between microbial cell surfaces and uranium (VI) in aerobic conditions



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# Defining the Interactions Between Microbial Cell Surfaces and Uranium(VI) in Aerobic Conditions

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To assist the U.S. Department of Energy (DOE) with long-term stewardship issues associated with bioremediation of uranium (U), the overall goal of this work is to define the mechanisms by which microorganisms facilitate the formation of U(VI) solid phases. Under anaerobic conditions, microbial reduction of U(VI) to U(IV) can potentially decrease groundwater U contamination by lowering solubility and by slowing migration through the soil. However, such biological alteration must be considered temporary unless long-term anaerobicity can be maintained. When aerobic conditions return, the more soluble, higher oxidation state of uranium, U(VI), will again be thermodynamically favored. Of the U(VI) solids, U(VI)-phosphates are of interest because of their relatively low solubilities. Microorganisms present in soils may play a role in the formation of U(VI)-phosphate solid phases. We are investigating the role of some individual bacterial strains (*Bacillus sphaericus* and *Shewanella putrefaciens*) commonly found in soils as well as microbial consortia isolated from the NABIR Field Research Center at Oak Ridge National Laboratory on U solid-phase formation. Data will be presented on the relative abilities of these bacteria to sorb U over a wide pH range, with special attention to the sorption behavior at low concentrations of U, such as would be commonly found in the environment. Cell surface functional groups responsible for U interaction are identified using TRLFS (Time-Resolved Laser-induced Fluorescence Spectroscopy). Bacteria are believed to influence actinide geochemistry through various mechanisms which are a part of the dynamic life cycle that defines the biogeochemical cycle of U. This information can then be used to design remediation systems that stimulate biological activity to favor the formation of U(VI)-phosphate phases.

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