

ACTINIDE INTERACTIONS AT MICROBIAL INTERFACES: AN INTERDISCIPLINARY CHALLENGE

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Bacteria are omnipresent in natural environments. They exhibit the highest biodiversity of any living organism and sometimes can adapt quickly to changing living conditions. Certain strains can even survive under harsh environmental conditions such as low or high temperature, high pressure, highly acidic and basic media and high-radiation fields. It is noteworthy that only one percent of the total soil microbial community can be isolated by the common culture-based isolation techniques. Only recently has one begun to obtain a description of the remaining 99% uncultured microorganisms through the application of genetic probes.

Microorganisms can interact with actinides by both direct interaction (biosorption, bioaccumulation, oxidation and reduction reactions) and indirect interaction (change of pH and redox potential). They may play an important role in the immobilization and mobilization of actinides in aquifers and subsurface environments.

This talk will present an overview on the current state of knowledge of microbial actinide interaction processes. Several detailed examples of the interaction of aerobic soil bacteria (*Pseudomonas*, *Bacillus* and *Deinococcus* strains) with uranium and plutonium will be discussed. Details of the nature of the bacterial functional groups involved in the interfacial actinide interaction process will be reported. Based on time-resolved laser-induced fluorescence spectroscopy (TRLFS) and synchrotron X-ray absorption spectroscopy (XANES and EXAFS) studies, molecular-level mechanistic details of the different interaction processes will be discussed. Areas of this emerging field in actinide research will be outlined where additional information and integrated interdisciplinary research is required.