

Bacterial Reduction of Metals and Radionuclides

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Many bacteria can reduce metals and radionuclides, including problematic environmental contaminants such as uranium (U), chromium (Cr) and the fission product technetium (Tc). Such transformations the chemical speciation of radionuclides and so impact their reactivity, solubility and mobility in the environment. For example, a range of bacteria can reduce U from soluble, and therefore mobile, U(VI) as UO_2^{2+} , to insoluble (and less mobile) U(IV) as UO_2 . The aim of this research is to understand the biochemical mechanisms behind these effects. An understanding of these mechanisms will help in predicting the environmental behaviour of the radionuclides and in developing methods to limit their migration. These effects could also be exploited in bioremediation technologies to treat contaminated land and to remove radionuclides from wastes and effluents prior to disposal. Current studies have focussed on bacterially mediated redox transformations of plutonium. The most stable environmental form of Pu is as insoluble Pu(IV) oxides. However, microbial reduction of Pu(IV) could lead to the remobilization of Pu as more soluble Pu(III) species.



Reduction of U(VI) by *G. sulfurreducens*. Right hand bottle contains U(VI), as UO_2^{2+} in solution. Left hand bottle contains UO_2 formed after the incubation of *G. sulfurreducens* with UO_2^{2+} for 24 h.