

Interaction of nanoparticles with microorganisms

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Nano-mineralization by microorganisms is a key process that can constrain the migration of actinides and REEs. This study demonstrates the REEs accumulation experiments to understand the effect of pH, coexistent REEs and the functional group of cells surfaces on the crystal chemistry of biogenic nanoparticle formation. During the experiment at 25 oC, all REEs were removed from the solution by 24 h at pH 4 and 5, while 50 % of the initial amount remained in the solution at pH 3 after 24 h. The nano-particles at pH 3 had monazite structure, while the particles forming at pH 4 and 5 were amorphous. The REE pattern at 24 h indicated the preferential uptake of LREEs. In case transuranic elements coexist, those elements should be preferentially incorporated into the particles compared to REEs. No cytotoxicity of CeNPs was detected; however, CeNPs induced an excess expression of two proteins: Eno2p and Rps24bp. The released organic substances enhanced anion adsorption and changed surface property of CeNPs. This leads to high colloid stability in solutions. This process is of great importance in the migration of radionuclides in the subsurface environment.

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