

INFLUENCE OF AUTOCHTHONOUS MICROORGANISMS ON THE MIGRATION OF REDOX-SENSITIVE RADIONUCLIDES

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Technetium (atomic number 43, Tc-99 half-life is $2.13 \cdot 10^5$ years) is the lightest radioelement in the periodic system. Primordial Tc has decayed, but today Tc is produced in nuclear power plants (6% of the fission products). Tc occurs mainly in two oxidation states. Tc(VII) as the pertechnetate anion TcO_4^- is highly mobile and has been used as a tracer in hydrogeologic studies. Under reducing conditions, Tc(IV) is chemically stable like $\text{TcO}(\text{OH})_2$. Tc(IV) compounds have a very low solubility, they are more or less immobile in aqueous systems. The mobility of redox-sensitive radionuclides in soils and sediments is affected by biotic parameters. Microorganisms interact with the redox-sensitive elements Technetium (Tc) and Selenium (Se) by adsorption, reduction/oxidation, incorporation and complexation processes. To estimate the influence of autochthonous microorganisms, special procedures for drilling, sampling and carrying out the experiments were applied to avoid microbial contamination. Sorption experiments with nonsterile surface material and allochthonous microorganisms showed a high immobilization of Tc and Se. This immobilization was not predictable by thermodynamic calculations with computer codes. Former investigations with high fixation of Tc and Se have been done under normal laboratory conditions. These experiments were carried out with groundwater avoiding any microbial contamination. It could be shown that the microbial population of the sediments was rather low and that microbial activity was not high enough for a significant fixation of Tc (colony forming units CFU = 10^6).