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Flow through bioreactor for radioactive waste purification

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Liquid radioactive wastes (LRW) are multi component systems consisting of various macro-components like nitrate, sulfate ions, extractants, solvents and detergents and as well of microcomponents-radionuclides (U, Cs, Sr, Tc) and metals Cr, Zn, Cu etc. The aim of this work is the use of bacteria for waste denitration and purification from radionuclides and toxic metals. Here we used the microorganisms separated from extreme habitats: Repositories of radioactive waste, alkaline lakes of Kulunda Steppe, (salinity up to 300 g/l and pH 9-11) and underground water, contaminated with nitrate and radionuclides. All of strains were able to reduce nitrate anions to molecular nitrogen and metals from high valence to low. We used radwaste models, based on the data of FSUE "RADON" analytical laboratory. The concentration of nitrates varied from 4 to 100 g/l, sulfates up to 2 g/l, bicarbonate HCO₃ up to 10 g/l with pH 9-10. Laboratory designed bio-filters with different types of cultivation (in static and flow-through conditions) were used. During the cultivation in the flow-through bio-filter system the rate and degree of nitrate consumption has been significantly increased by formation of a surface bio-film on an inert carrier providing higher specific surface. Bacterial cells were able to immobilize radionuclides from the solution U (88-96%), Th (up to 90 %) Sr (50-60 %), Tc, Cs and toxic metals Cr, V, Mo, La, cause to purification of radioactive waste.

Biography

Alexey Safonov has completed his PhD in Ecology and he is a Senior Researcher, Head of Biotechnology and Radioecology group in Frumkin Institute of Physical Chemistry and Electrochemistry of Russian Academy of Science. His interests are: Microbiology of radioactive waste repositories, biogeochemistry and *in situ* bioremediation, bio-treatment of waste, radioecology, uranium mill tailing, bacterial fungal and algae abilities for metal sorption and reduce, flow-through bio-filters, bio-electrochemistry and biosensors, Tc chemistry, trans-uranium radionuclides and fission products and radio medicine.

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