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Biological Barrier for Nitrate Ions in Environments

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Disposing of the nuclear industry wastes in Russia and the U.S.A. in the 20th century have led to significant amount of storages not equipped with appropriate effective/protective barrier systems. This pose risks of environmental pollution through dissipating harmful macrocomponents and radioactive nuclides. The basic RW macrocomponent are nitrate ions present at concentration levels from 10 to 350 g/dm3. These are rather toxic for ecosystem for the and are characterized by high migration level. The factor that can significantly impact to the migration profiles of nitrate and metals in the environment is the influence of biochemical processes.
The purpose of this work is to create a barrier for the immobilization of nitrate ions in subterranian freshwater through the intensification of biochemical processes by organic matter around the artificial pond –surface repository B-2 with LRW at the Siberian Chemical Combine. It will be the part of the existing barrier system of the conserved repository B-2 at Siberian Chemical Combine. Nowadays there is new geochemical barrier based on silicate polymers in groundwater around the conserved repository. It can block main radionuclides with very high efficiency, but can't slow-down the nitrate ion migration risk. The concentration of nitrates in groundwater around the conserved repository can crease up to 5000 mg per liter. The essence of the biobarrier method is to stimulate the vital processes of autochthonous (indigenous) microorganisms leading to the destruction of nitrate ions to ecologically safe molecular nitrogen by injecting to contaminated zone as organic substrates into groundwater around the repository.
In laboratory conditions, indigenous bacteria of groundwater samples were proved to be able to decrease nitrate concentration from 3-5 g/l to 10-15 mg/l when were amended with acetate, sucrose, lactate, or glucose in concentration 1-5 g/l as electron donor and carbon source. These results are the scientific basis for the development of biobarrier technology. This biotechnology could improve the existing barrier system of repository B-2.
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