Indigenous model to carry out colloid facilitated decay chain radionuclide transport modeling for fracture-rock coupled geological system

Deep geological repositories are considered as one of the best option for permanent disposal of high level radioactive waste. Fractures may appear because of mechanical stress created during the construction of the disposal facility and/or due to thermal/radiation effects due to the presence of radioactive waste. Presence of colloids in fractures developed over years in the deep geological disposal facility is a definite possibility. This could lead to faster transport of contaminant into the aquifer below. A numerical model is developed to simulate the colloid facilitated radionuclide transport in a coupled fracture-rock matrix, in case of complete failure of the high level waste matrix. The model accounts for the processes of advection, diffusion, surface adsorption, sorption on the colloid surface and radioactive decay within the fracture , the diffusive loss of the radionuclide from the fracture water into the pore water of the host rock matrix and the dispersion, adsorption and radioactive decay in the host porous rock. The model also incorporates the production of progeny radionuclides due to decay of parent radionuclide with long decay chains. Such a model is useful for safety assessment of high level waste deep geological repositories.

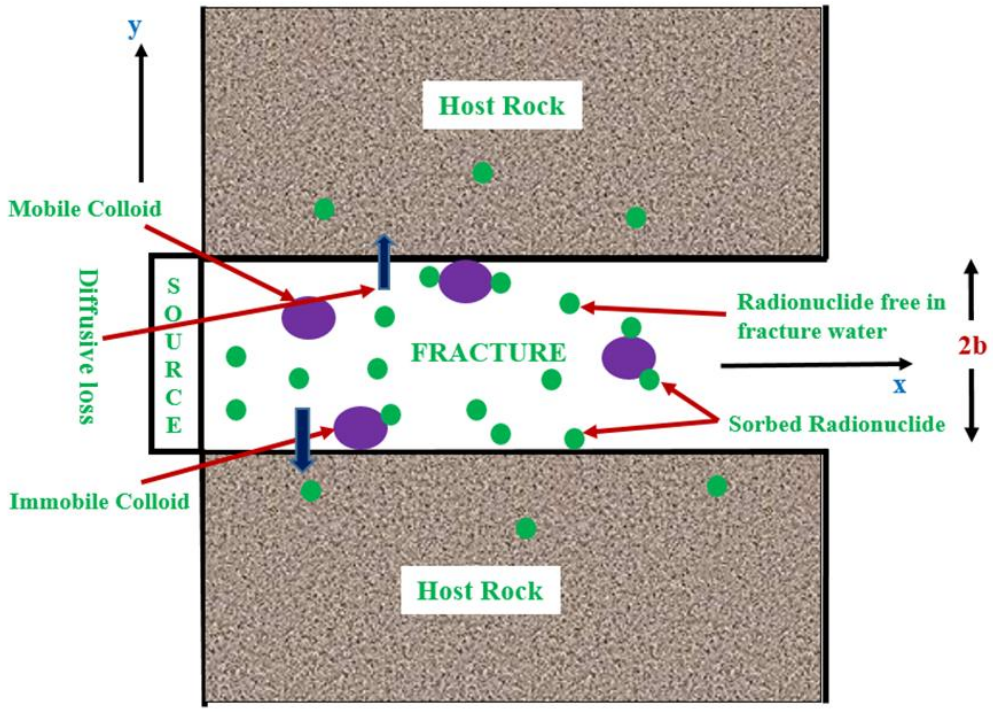

Figure-8: Conceptual picture of colloid facilitated radionuclide migration in coupled fracture-rock matrix