Centrifuge Modeling of Contaminant Diffusion Through GeoEnvironment

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Geological isolation of nuclear waste is considered as the suitable option worldwide to protect man and environment for extended period. Siting and site characterization to assess the long term behaviour of geoenvironment involves detailed investigations on geological, hydrological and geotechnical characteristics based on various laboratory, field experiments and development of mathematical models. However, laboratory and field experiments are time consuming and lack simulation of field conditions due to complexity of boundary conditions related to nuclear waste migration processes. In order to overcome the difficulties associated with natural processes, centrifuge modeling technique is being adopted by researchers to model the various geoenvironment problems. Present study describes the various stages of centrifuge modeling technique to model the contaminant diffusion through man made engineered barrier system like bentonite-sand backfill and natural barrier rock mass. Advantageous of centrifuge modeling technique is highlighted. Experiments conducted using small scale physical model in a geotechnical centrifuge under modified gravitational field to model diffusion process through intact and fractured rock mass of Charnockite rock formation, Kalpakkam, India reveal that the experimental duration is reduced by N2 times, where N is the applied acceleration due to gravity. Such studies are useful in assessing the suitability of geoenvironment for locating nuclear waste disposal systems and to assess their long term behaviour.