

Determining Diffusive Parameters of Contaminants out of Geo-Materials through Out-Diffusion Experiments

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Diffusion through and sorption onto a geo-material are prominent mechanisms associated with mass transport within it when groundwater flow is very low. Several laboratory diffusion test methods have been available and have been applied to evaluate effective coefficient and capacity factor. Conventional laboratory diffusion tests are generally laborious and time consuming and some methods need to slice test specimens. This study focuses on the process that heavy metals, such as lead (Pb), diffuse out of geo-materials. To establish an out-diffusion experiment method, a theoretical solution was derived based on the linear sorption model. Parameter studies were then performed to understand the effects of each parameter on experimental duration. To shorten the time required for a diffusion test, a relative large diameter specimen and a relative small reservoir volume should be adopted which can enlarge mass exchange areas and make concentration of a targeted element in the reservoir vary rapidly. Theoretically, the length of a specimen does not affect the time required for an experiment. Sampling with different frequency may induce experimental errors. A series of experiments were conducted to verify this out-diffusion test method and to study lead diffusion out of a sandstone.

Keywords: mass transport, diffusion, out-diffusion experiment, contaminants, heavy metal, lead