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Theoretical and Technical Criteria for Selecting and Designing Laboratory Diffusion Tests

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Mass transport in geo-environments is primarily controlled by advection, dispersion and sorption if no chemical and/or bio-chemical reactions and chain decay are involved. When permeability is low and/or hydraulic gradient is extremely small, mass transport in a geological stratum such as a clay layer will be controlled by diffusion and sorption.

To properly select a test method, and to effectively perform a laboratory diffusion test, theoretical solutions to both through and in-diffusions are overviewed. Based on discussion of analytical technologies for different kinds of chemicals, such as contaminants and/or nutrients associated with bio-remediation of volatile organic compounds (VOCs), this presentation illustrates how to selection a test method, how to shorten required testing time, how to determine sampling interval and how to interpret experimental data.

Keywords: laboratory diffusion tests, through-diffusion, in-diffusion, theoretical solution, analytical precision