KEYNOTE ADDRESS

CHEMICAL DELIVERY AND MIXING: CHALLENGES AND OPPORTUNITIES

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In-situ remediation technologies have the potential to remove contaminants at low cost and without transferring contamination to a different medium. For example, though delivery of appropriate additives and removal of products that may impede reactions, one can stimulate indigenous microbial populations that can break down contaminants, thus working with nature. However, the rate of biogeochemical reactions in the field is almost always controlled by the rate of delivery and mixing of reactants. The severity of mass transfer limitations has unfortunately been often underestimated in the design of remediation projects, resulting in disappointing results. Mass transfer limitations need to be taken seriously into account when devising remediation schemes and must be diminished through appropriate technologies and engineering design. Even with improved technologies, mass transfer limitations impose constraints on the time it takes to achieve clean-up goals that must be considered when setting policy. This talk is a broad overview of mass transfer limitations in relation to chemical delivery and mixing; the challenges in achieving satisfactory reaction rates; and opportunities in developing enhanced and cost-effective in-situ remediation. The case of in-situ bioreduction of U(VI) at Oak Ridge, TN, is presented to illustrate some of the concepts. Also this talk will provide general background and key issues which will be discussed in greater detail throughout the session.