RDD: Radiological Dispersal Devices

Decontamination Strategies

In a “dirty” bomb scenario, radioactive contamination may not be restricted to a building’s exterior but penetrate deeply into its concrete. We are developing a model that predicts and optimizes how electrokinetics can be used to remove radionuclides from the concrete.

Left: *An example of how the decontamination of building exteriors may appear to the casual observer.* **Inset:** *The ELECTROSORB “C” process can remove thorium and uranium contamination from concrete. The technology consists of the SEEC pad and cylinders that store the contaminants. (Photo provided by ISOTRON Corp.)*

Background

The decontamination of concrete and other building materials is a necessity in response to a Radiological Dispersal Device (RDD) or “dirty” bomb. Numerous techniques such as abrasive methods, ultrasonics, and concrete surface layer removal have been used to remove radioactive contamination from concrete. However, many of these techniques are not as effective for cases in which the radionuclides have penetrated deeper into the bulk of the concrete. Processes that are based on electrokinetic phenomena have been shown to decontaminate 70 to over 90% of the surface radioactivity. In addition, efficient removal of radionuclides that penetrated deeper into the concrete has also been achieved.

Capabilities

We are developing a model to simulate the transport of radionuclides through the pores of the concrete and into the anolyte and catholyte. Specifically, we are modifying the LANL porous media simulator FEHM (Finite Element Heat and Mass-Transfer) code so that it can model electrokinetic processes. Once complete, the model will be verified against experimental data that is available in the literature. The first step in this project is to develop a standalone one-dimensional simulator.

Future Applications

Once the one-dimensional simulator is complete and verified, the electrokinetics module will be incorporated into FEHM. FEHM will then be able to explore parameters such as optimum electrode placement, the effects of chemical and physical heterogeneity as well as other key electrokinetic parameters that affect the decontamination process.

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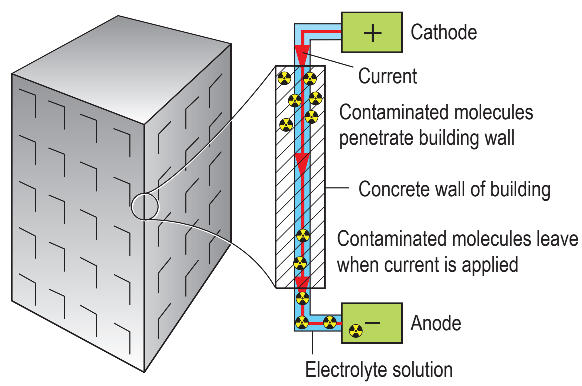
This work is being conducted in collaboration with the All-Russian Research Institute of Experimental Physics and Moscow State University.



Right: Schematic showing in-situ non-abrasive electrokinetic process for removing contaminants from concrete with limited generation of secondary waste.

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