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ELECTROKINETIC DECONTAMINATION OF CONCRETE

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DISCLAIMER

4.3 Electrokinetic Decontamination of Concrete

CONTRACT INFORMATION

Contract Number	DE-AC21-93MC30162
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ABSTRACT

Concrete structures which have been contaminated with uranium and other radioisotopes may be decontaminated using in-situ electrokinetic remediation. By placing an electrode cell on the concrete surface and using the concrete's rebar, a ground rod, or another surface cell as the counter electrode, the radioisotopes may be migrated from the concrete into this cell. The process is highly dependent upon the chemical parameters of the species involved; namely, the concrete, the contaminants, and the solubilizers used to mobilize the contaminants.

The chemical behavior of concrete may be described as similar to the behavior of calcium hydroxide having a high pH and a high calcium content. Concrete is also fairly reactive toward the contaminants incorporating some of the contaminants in the cement matrix.

Uranium may be found in concrete in either the +4 or +6 oxidation states with roughly 80 percent being found in the latter. Uranium is readily solubilized at basic pHs, the condition of concrete by many oxygen-donating ligands. The applicability of these complexants is dependent upon the solubility of these ligands at high pH and as calcium salts.

In a preliminary study conducted at the K-25 site of the Oak Ridge National Labs, an estimated removal of > 40 percent of uranium has been observed for a short duration run. This removal occurred using traditional uranium solubilizers in contact with the contaminated surface.

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It has also been observed that complexants which form soluble calcium salts can be migrated through concrete and induce uranium removal enabling decontamination of deeper regions of the concrete.

The results show a varying ratio of uranium removed to activity removed. Some post-test solutions show a high activity with only modest uranium concentration, and some results show a high concentration of uranium with a low total activity. These results appear more dependent upon decontamination strategy than solubilizer used.

The results obtained from the study suggests further work which can be performed to further the process toward large-scale remediation. This work includes extended runs on well-characterized concrete to obtain a better estimate of the costs and removal efficiency. The work should also include a large-scale run to determine the problems unique to larger scale work. Remediation tests focusing on the removal of other isotopes in addition to uranium, and focusing on the use of the complexants which form soluble calcium salts is integral to the establishment of the use of electrokinetics for the decontamination of concrete.