Bioremediation of Hydrazine

Cleanup
CU-118

RESEARCH CATEGORY: 6.3 Advanced Development

LEAD AGENCY: U.S. Air Force

LAB: Air Force Research Laboratory - Tyndall Air Force Base, FL

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FY 1997 COMPLETED PROJECT

OBJECTIVE: Numerous industries use hydrazine fuels on a daily basis. The U.S. Air Force (USAF) and National Aeronautics and Space Administration (NASA) utilize the fuels as a high energy missile and rocket propellant. However, hydrazine usage is not isolated to the Department of Defense (DoD) and NASA. Numerous civilian companies use hydrazine in boiler rooms as a corrosion inhibitor, in the manufacture of agricultural chemicals, and in the development of pharmaceuticals. The primary objective of this project was to discover, develop, and optimize a cost-effective environmentally conscious, and biologically mediated process for the remediation of hydrazine disposal and spill response techniques/options.

BENEFIT: As a result of this research and development endeavor, a biologically mediated process for the in-situ remediation of hydrazine contamination will be developed. The technique will fully satisfy the USAF's need for a cost-effective and environmentally sound hydrazine degradation process. The remediation technique can potentially be applied to the remediation of other environmental contaminants.

ACCOMPLISHMENTS: The biocatalyst, diazoluminomelanin (DALM), has been selected for the remediation of hydrazine. DALM is a synthetic melanin, humic substance isolated from bacterial cell walls. The material, which is resistant to breakdown, is a free radical generator. The free radicals will be utilized in the destruction of residual hydrazine following a hydrazine spill. Toxicology and transport studies were completed in FY97 to ensure that degradation products are not harmful to the environment and to determine on a risk basis the effective range of biocatalyst that can be used during cleanup.

TRANSITION: The patent application covering the genetically engineered bacterium that produces the catalyst was filed in August 1997. The biocatalyst is now being supplied to Foster-Miller, Inc., that is developing a supersorbent gel containing the catalyst in order to take up spilled hydrazine so that it may be broken down by the contained catalyst. Foster-Miller is now in a Phase II Small Business Innovation Research (SBIR) that should have a field demonstration of the technology in the summer of 1998.