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Bioavailability of mercury in the floodplain soil of east fork popular creek, oak ridge, tennessee

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Abstract

Historically as part of its national security mission, the U.S. Department of Energy's Y-12 National Security Facility in Oak Ridge, TN acquired a significant fraction of the world's supply of elemental mercury. During the 1950s and 1960s, a large amount of elemental mercury escaped confinement and is still present in the watershed surrounding the Y-12 facility as a medium-term sink, but long-term source. A series of remediation efforts have been deployed in the watersheds of the Oak Ridge site. The objectives of this study were to investigate the current status of mercury distribution and determination of the speciation and bioavailability in the floodplain soils of East Fork Poplar Creek (EFPC) after decades of US Department of Energy's remediation. The present study clearly shows that the total mercury in floodplain soils of EFPC significantly decreased after a series of remediation. This study confirmed the long-term effectiveness of these remediation efforts, especially after excavation of highly contaminated floodplain soils. The major mercury form in the current floodplain soils of EFPC after these decades of remediation is mainly the non-cinnabar mercury bound form in clay minerals (4M HNO_3-extractable residual fraction). The results also show strong linear relationships between mercury concentrations in native earthworms (both mature and immature groups) and the non-cinnabar mercury form, while cinnabar mercury is less bioavailable to native earthworms. Native earthworms may be used as a potential mercury ecological bio-indicator (bio-marker) for demonstrating mercury bioavailability and ecotoxicity in the ecosystem.

Biography

Dr. Han has completed his Ph.D in 1998 from the Hebrew University of Jerusalem, Israel. He is Assistant Professor of Environmental Chemistry in Department of Chemistry and Biochemistry at Jackson State University. He has published more than 70 papers refereed journals, one book (by Springer) and serving as an editorial board member of a number of international journals.