Abstract Submitted to
1997 Denver X-Ray Conference
Denver, Colorado - August 4-8, 1997

BNL-64346
ABSTR.

Elemental Analysis of Contaminated Sediments From NY/NJ and Hamburg Harbors Using Synchrotron Radiation-Induced X-Ray Emission (SRIXE)*

K. W. Jones
Brookhaven National Laboratory, Upton, NY 11973)

S.-R. Song
National Taiwan University Taipei, Taiwan and
Brookhaven National Laboratory, Upton, NY 11973

Dredging of marine navigation channels in ports is commonly required to provide safe conditions for shipping and to minimize operating costs. However, the sediments often contain organic and inorganic contaminants at levels that are high enough to make environmentally responsible disposal a problem. Solutions include the use of confined disposal facilities, borrow pits, and decontamination followed by a beneficial reuse. A knowledge of the contaminant concentrations on a sediment grain-size scale as well as on a macroscopic scale is needed to provide a firm basis for understanding long-term environmental impacts by modeling the transport of contaminants from the disposal site. The data is also needed to serve as the basis for designing improved chemical extraction technologies for decontamination and for determination of the stability of the resulting products such as soils, glass, cement, and construction aggregates.

An initial investigation of grain-size distributions of inorganic contaminants in estuarine sediments from the New York/New Jersey (NY/NJ) Harbor and Hamburg Harbor of Germany has been carried out using SRIXE. The experiment was performed at the SRIXE microprobe at the Brookhaven National Synchrotron Light Source and measured the spatial distributions of elements with $Z>20$ in individual particles with a resolution of 10 μm.

The sediments were separated into size fractions ranging from over 2 mm to less than 56 μm. At least 20 individual grains in each size fraction were analyzed so that an estimate of the concentration variation from particle to particle could be found. The results show that: 1) concentrations of Fe, Cu, and Zn were greater than the concentrations of other elements; 2) the concentrations roughly increase with the particle sizes; 3) the concentrations of metals in individual grains of the different size fractions are very nonuniform; 4) all metals show roughly positive correlation. The results for Hamburg are similar to those found for the NY/NJ Harbor sediments, although the elemental concentrations are lower. The spatial distributions suggest that the common assumption that metals are found largely on a surface layer rather than being distributed through the entire volume of the particle needs further investigation.

*Work supported in part by the US Department of Energy under Contract No. DE-AC02-76CH00016 (KWJ).