PROPERTIES OF NEW YORK/NEW JERSEY HARBOR SEDIMENTS*

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Sediments found in waterways around the world often contain toxic compounds of anthropogenic origin that can harm the environment and human health. As a result, it is often necessary to remove them and find ways to dispose of them in an environmentally and economically acceptable way. While this may seem to be a simple process, in reality, it is a complex interplay of political and economic forces that must be based on the best scientific knowledge from biological, chemical, physical, and engineering sciences. Some examples of sites that exemplify the problem are: New York/New Jersey Harbor, the Great Lakes, and Port of Seattle/Tacoma in the United States, Port of Venice in Italy, Port of Rotterdam in the Netherlands, and many regions in China. In the NY/NJ region, the U. S. Environmental Protection Agency Region 2 has carried on a long-term demonstration project that aims at processing dredged sediments to remove contaminants and produce saleable products thus leading to a new industry based on the creative use of sediments viewed as a sustainable material resource.

Here, we report on results obtained in an experimental program to characterize the nature of the sediment contamination. The objective was to gain a better understanding of the properties of the sediments to develop better methods for understanding the fate and transport of the contaminants and for improving methods for their removal from the sediments. Our investigations made use of x-ray facilities at the Brookhaven National Synchrotron Light Source and the European Synchrotron Radiation Facility at Grenoble, France. The experiments included:

- Measurements of the microstructure of the sediments using computed microtomography. Analysis of the 3-dimensional tomographic data gave information on the porosity, specific surface area, permeability, and tortuosity of the materials.
- X-ray absorption and fluorescence microscopy with resolutions as low as 0.2 micrometer to obtain information on the relationships of organic and mineral components of the sediments and on the distribution of contaminants on the surfaces of the sediment grains.
- Functional groups of chemical compounds were investigated using x-ay absorption near-edge spectroscopy (XANES) and FourierTransform Infrared Spectroscopy.
- Scanning electron microscopy (SEM) and electron probe measurements were made to ascertain the morphology of the sediment surfaces and the distribution of metals on individual sediment grains.

Finally, we will provide an overall status report on the large-scale implementation of the use of decontamination technologies in the Port of NY/NJ.

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