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Methane Hydrate Studies: Delineating Properties of Sediments by Computed Microtomography (CMT) *

S.Yoon, K.W. Jones (BNL), H. Feng (Montclair State University), W. J. Winters (USGS-Woods Hole), and Devinder Mahajan (SUNY, Stony Brook)

Beamline(s): X27A

Natural gas hydrates are primarily located in ocean floor sediments and in the Arctic permafrost. Recent estimates suggest that, worldwide, hydrates may contain up to 10^{22}g carbon stored in them. It is, therefore, inferred that gas hydrates contain more CH_4 than all other known reserves combined. The U.S. gas hydrate reserves are estimated to be as high as 40% of the worldwide total but an acceptable production method is yet to be identified. A recent report released by the Office of Fossil Energy/U.S. Department of Energy [*National Methane Hydrate Multi-Year R&D Program Plan. DOE/FE,* June 1999] identifies knowledge gaps at the fundamental level that must be addressed to develop an environmentally safe method to produce CH_4 from natural gas hydrates.

One of the issues in Gas Hydrate R&D is to understand the properties of sediments that serve as hosts to gas hydrates. BNL has initiated a fundamental study to address this theme. One of the innovative analytical methods to be applied in the proposed investigation is computed microtomography (CMT) at the NSLS beam lines X27A. Previous work of of relevance for the methane hydrate studies are the ongoing CMT work at BNL on: 1) dredged sediment samples from the New York/New Jersey Harbor and 2) sandstones and geological specimens to determine the microcomposition and microgeometry that yield quantitative data on extent of the variability of porosity, permeability and connectivity of the pore space, mineral composition. The hydration number of synthetic hydrate can be calculated from the P-T data using the Clapeyron Equation. The present set-up is suitable for study on the simulated sediments (both consolidated and unconsolidated) and synthetic hydrate samples. Sediment samples for the study have been obtained from Blake Ridge, off the coast of the Carolinas, the first U.S. test site of methane hydrates. The first CMT test measurements on these samples have been made and are now being analyzed.

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