

Three-Hour Short Course - A Primer on Natural Gas Hydrates

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Abstract

This overview of gas hydrates in deep marine and permafrost settings is targeted at geologists and others interested in gas hydrates as a potential energy resource; geologists, geophysicists, geochemists, and reservoir engineers who work in environments where gas hydrates may represent a hazard to drilling and production activities; and individuals interested in the possible interrelation between atmospheric methane and destabilized gas hydrates.

Published gas hydrate resource estimates are highly speculative, but the total amount of gas in the gas hydrate accumulations of the world may rival the volume of known conventional gas resources. Gas hydrates can also pose a problem to conventional drilling and production activities. Recent studies also indicate that gas hydrate stability may be sensitive to global climate change. To understand gas hydrate resource, hazard, and climate change issues, a good grasp of the geologic and geochemical parameters that control the occurrence and stability of gas hydrate in nature is needed.

This course will first provide a comprehensive introductory overview of the chemical and physical properties of the various forms of gas hydrate. Here we address the fundamental questions:

- What are hydrates? How do the physical properties derive from the molecular structure of hydrates?
- How do gas hydrates form? What are the geochemical and geologic parameters believed to control the formation and stability of gas hydrate in nature?

Examples of known marine and permafrost-associated gas hydrate accumulations throughout the world will be examined in detail. These include the discovered marine gas hydrate accumulations in the Gulf of Mexico, along the eastern margin of India, and in the Nankai Trough off the southeast margin of Japan. In addition, the well-known permafrost associated gas hydrate accumulations in northern Alaska and Canada will be investigated.

Finally, we will look at the geologic, geochemical, and geophysical tools and procedures used to identify and quantify gas hydrate occurrences. We will also examine the drilling and production hazards associated with gas hydrate and the possible interrelation between gas hydrate and global climate change.