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M.S. PLAN B
PRESENTATION & DEFENSE
MONDAY, APRIL 28, 2014
HOLMES HALL 400
1:00 PM**

Effect of the Properties of Porous Media on Hydrate Stability

Abstract

Large reservoirs of methane hydrate exist in arctic permafrost and seafloor sediments. The physical properties of the permafrost and marine sediments are believed to affect hydrate stability. In 2004, Uchida *et al.* investigated the decomposition of methane hydrates formed in porous media using a laboratory pressure facility. They observed a shift of the hydrate stability curve and concluded that hydrate decomposition is mainly affected by pore size. To extend this study, a calorimetric investigation of methane hydrate formation and decomposition in various porous media was conducted to explore the effect of the properties of those media. This study employed a novel experimental facility which couples calorimetry with Raman spectroscopy. Media tested included two “standard” sands which have been employed in laboratory studies undertaken as part of the national methane hydrate research programs in the U.S. and Japan. The present experimental results suggest that, at a given pressure, methane hydrate forms and decomposes at a slightly lower temperature in sand matrices than bulk hydrate (i.e., pure hydrates in the absence of sand). This slight shift agrees with the earlier results of Uchida *et al.* (2004). The relevance of this effect to seafloor stability in methane hydrate zones and to estimates of the amount of methane contained in hydrate reservoirs is discussed.