

Kinetics of methane hydrate formation and dissociation in sand sediment

Thi Xiu Le, Stéphane Rodts, David Hautemayou, Patrick Aimedieu, Michel Bornert, Baptiste Chabot, and Anh Minh Tang

Laboratoire Navier (UMR8205 IFSTTAR-ENPC-CNRS), Université Paris Est, Marne-la-vallée, France
(anh-minh.tang@enpc.fr)

Methane hydrate is being considered as a potential future energy source but also a considerable geo-hazard. In this study, methane hydrate bearing sand sediment was firstly created by pressurizing methane gas into already chilled moistened packed sand specimen (excess gas method). The excess gas was then replaced by water at high pressure. Afterward, a heating/cooling cycle was applied under undrained conditions in order to completely dissociate gas hydrates and then recreate them inside the specimen. Finally, the pore pressure was reduced to zero to dissociate the gas hydrates. The whole process was performed in a magnetic resonance imaging (MRI) system allowing the determination of water and/or gas and hydrate quantity (and spatial distribution) at various times. The MRI signal was finally analyzed to interpret various processes in sand sediment: initial hydrate formation, heating-induced hydrate dissociation, cooling-induced hydrate re-formation, and depressurizing-induced hydrate dissociation.