

148ae Mass Transfer of a Methane Hydrate under Controlled Conditions of Water

Keiichi Ogasawara, Akihiro Yamasaki, and Fumio Kiyono

In order to obtain the dissociation rates of methane hydrate for an accurate simulation of methane production from the methane hydrate-bearing layer, a suitable reaction system must be planned in the laboratory. We made a newly-developed laboratory-scale experimental apparatus as thermal recovery method for production of natural gas. We can measure dissociation rates of methane in the quasi methane hydrate-bearing layer under flow conditions of water using this apparatus. A dissociation model of methane hydrate was developed that express the methane flux and mass transfer of dissolved methane in the bulk water phase. The dissociation rates of methane hydrate at the surface was determined based on the proposed model using a correlation equation for the surface area of methane hydrate-liquid interface with the experimental results of apparent dissociation rates. The methane hydrate was formed with packed particles (e.g. glass beads; standard sand) in the apparatus that can be also obtained the formation rates of methane hydrate at that time, and was dissociated under a given condition of temperature, pressure, and ambient water flow velocity. The apparent dissociation flux was determined from the time course of the concentration of methane dissolved in the ambient water flow and volume of methane gasified from the outlet water at atmospheric pressure. The methane hydrate dissociation rates were determined under various flow conditions of ambient water, pressure, and temperature. The methane recovery rates were measured using low-temperature water in view of mass transfer that depend on concentration gradient of methane, and using higher temperature water in view of thermodynamics. This research was supported by MH21 Research Consortium.