

GAS HYDRATE INHIBITION AND ITS UNIQUE THERMODYNAMIC BEHAVIORS WITHIN THE POROUS CLAY SEDIMENT

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The fundamental understanding of gas and water system in geological sediments is necessary for greenhouse gas sequestration and future energy production. Depending on the surrounding environments that water, gas, and other substrate material coexist, several unique phases such as supercritical, dissolved gas, gas oversaturated, and hydrate could be formed. Especially, gas hydrates which are composed of water frameworks and several gaseous guest molecules have drawn people's attention for its application such as methane production with carbon dioxide sequestration. For these reasons, to produce methane from natural gas hydrate and store carbon dioxide by replacement reaction, the thermodynamic behaviors of gas hydrate and its stability have become an important issue. Therefore, in this study, we investigated the physicochemical behaviors of intercalated gas hydrate such as unique dissociation patterns, cage occupancy, and phase equilibria in depth. Moreover, we suggested the precise location where gas hydrates are formed within the clay sediment considering the effect of unique surroundings and pore dimension. To analyze the effect of interlayered structure and pore dimension of clay on properties of gas hydrate, Na-montmorillonite and aluminum pillared clay (aluminum pillared montmorillonite) were used and compared.

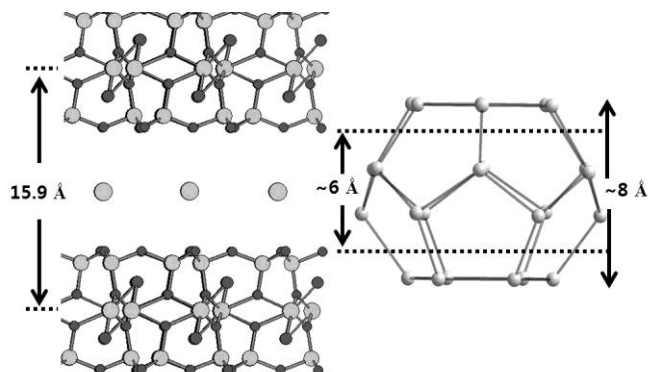


Figure 1 – Schematic illustration of the structure of clay sediment and 5¹² hydrate cage with their dimensions