

Formation of Gas Hydrate from The Blast Furnace Gas of a Steel Mill for The Separation of CO₂

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A concept of CO₂ separation based on gas hydrate technology was suggested [1]. In this work, the hydrate formation phase equilibrium conditions were investigated for flue gases to separate CO₂ using gas hydrate technology. The target gases include two mixed gases consisting of CO₂ and N₂ which are simplified flue gases, and blast furnace gas (BFG) (CO₂ : CO : H₂ : N₂ = 20 : 23.8 : 3.5 : 52.7) which is a model composition of BFG emitted from POSCO. First, the phase equilibrium conditions of gas hydrate were measured for each gas. For the fast acquisition, the “continuous” quartz crystal microbalance (QCM) method was employed. Then the phase equilibrium conditions of gas hydrate were measured when the promoter was added with various concentrations. The studied promoters were tetrahydrofuran (THF), propylene oxide and 1,4-dioxane, which are all expected to form a structure II hydrate. In addition, the crystal structure of gas hydrate was analyzed by XRD.

[1] Kang et al. Environ. Sci. Technol. 2000, 34, 4397

[2] Lee et al. Energy & Fuels 2012, 26, 767