A study on CO_2 methanation properties of Ni-based catalyst in a bubble fluidized bed reactor

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The energy storage systems (ESS) for storing unused power and stabilizing power supply are required to prepare for increase in the share of renewable energy. A power to gas, methanation is most suitable for long-term, and large-capacity storage. The methanation is a method of converting carbon dioxide (CO_2) into methane (CH_4) and storing it as energy, which can contribute to greenhouse gas reduction. We investigated the CO_2 methanation performance of Ni/Al_2O_3 catalyst at the various conditions in the bubble fluidized bed. The axial gases concentration, temperature, and conversion were densely analyzed. The

temperature increases by up to 11 °C from 340 to 351 °C within the first 30mm of the bed. The CO_2 conversion was about 90% within 50mm from the bottom of the reactor and was maintained above the height. The Ni/Al_2O_3 catalyst had a highest CO_2 conversion of 94% at 320 °C. In addition, a reaction kinetic model using modified factors was proposed and compared to experimental data.