

Analysis of CO₂ capture performance with supplying the regeneration energy by in-bed heat transfer horizontal tubes in the dry sorbent CO₂ capture system

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Fluidized beds are widely used in many fields, where the heat transfer characteristics of those systems become principal for successful operation. The target process of the study is CO₂ capture process by dry sorbent, which is exothermic or endothermic gas-solid systems consisting of a fast fluidized bed reactor and a bubbling fluidized bed reactor. When a reaction is highly endothermic, the heat of reaction should be supplied by heat sources. We used bench-scale dry sorbent CO₂ capture process with 2 Nm³/h of gas treatment capacity. Experiments have been conducted to analyze heat transfer characteristics between steam-heated multiple horizontal tubes and solid sorbents of which average diameter is 100 micron in the bubbling fluidized bed reactor. The regeneration temperature was maintained around 150°C and controlled by supplied steam flow rate. The CO₂ removal in the carbonator was maintained around 75%, which indicated that the regeneration energy was appropriately supplied by the in-bed type heat exchanging tubes with steam.