Thesis Title	Characterization of Thai Limestones for Desulfurization in a Fluidized Bed Combustor
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Abstract

The objective of this research is to determine the chemical kinetics of desulfurization using Thai limestone from various sources in a fluidized bed combustor. From the effects of operating parameters obtained from the experiments as well as chemical and physical properties of limestone, the empirical equations can be established to apply with the appropriated mathematical model in order to predict the efficiency of desulfurization. The experiments were done in a fluidized bed furnace with 8.5 cm diameter, 150 cm height and 10 cm static bed height. The addition of limestone was a batch process and limestone average size was 0.725-0.975 mm. In this study furnace temperature was 750-850 $^{\circ}C$, U/U_{mf} was 2-3.5, and Ca/S was 2 (by mole). The 6 sources of limestone were used in the experiments. All the experimental results were analyzed and used for the estimation of reaction rate constant (k_s) and deactivation rate constant (k_d).

When the air velocity was increased, both k_s and k_d increased, because the gas film resistance for mass transfer decreased. When the bed temperature was increased, k_s increased due to the increase in chemical reaction rate, but showed less effect to k_d. The increase in limestone size caused k_s decreased because the larger particle size gives less specific surface area and low diffusion coefficient, but k_d increased because of the longer of intra-particle diffusion path. The different source of limestone showed the different values of k_s and k_d due to the variation in chemical composition, surface area, porosity, morphology of the limestone and pore size distribution.

From the effecting parameters, we developed the general empirical equation to predict k_s and k_d which were used as input parameters for the selected mathematical model. The prediction results were in good agreement with the experimental data reported in the literature.

Keywords : Chemical Kinetics / Sulfation / Limestone / Fluidized Bed / Desulfurization