

Modeling of fluidized-bed CO₂ capture process using a K₂CO₃-based sorbent

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CO₂ capture by regenerable sorbents is a promising alternative technology due to its potential for low operating temperature and low energy requirement. In this study, a dynamic model for CO₂ capture process using K₂CO₃-based sorbent was developed to investigate dynamic behaviors inside the reactor. The CO₂ capture process includes a fast fluidized-bed carbonator and a bubbling fluidized-bed regenerator for repeated circulation of the sorbent. The carbonator and regenerator models implemented rigorous reaction kinetic models for the sorption and regeneration reaction. The validation of the model was confirmed by accurately predicting experimental results at various operating conditions. The effects of various operating and system parameters on CO₂ capture performance were investigated by using the developed model. The case study on the parameters could help to design more effective CO₂ capture process with the sorbent.