Structural effects of alumina on the potassium-based sorbents for post-combustion CO_2 capture

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Potassium-based alumina sorbents were prepared by impregnation of various Al_2O_3 with 30 wt.% K_2CO_3. Their CO_2 sorption and regeneration properties were investigated in a fixed bed reactor during multiple CO_2 sorption and regeneration tests at a low temperature range between 60°C and 200°C. The regeneration capacities of the potassium-based alumina sorbents increased with increasing calcination temperature of alumina. It is because the formation of $KHCO_3$ increased with increasing calcination temperature during CO_2 sorption, whereas the formation of $KAl(CO_3)(OH)_2$ decreased. In particular, a potassium-based sorbent using α-Al_2O_3 maintained the high CO_2 capture capacity of 90 mg CO_2/g sorbent without deactivation during multiple cycles. From these results, it is concluded that the CO_2 sorption and regeneration properties of the potassium-based alumina sorbents are affected by the structure of alumina.