Regeneration Properties of Lithium Orthosilicate -Based Sorbents for CO₂ Capture at High Temperatures

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Lithium orthosilicate (Li_4SiO_4)-based sorbent was prepared by physical mixing Li_2CO_3 with SiO_2 in the molar ratio of 2, which was donated as a LS2 sorbent. Its CO_2 sorption and regeneration properties were investigated in the fixed-bed reactor during the multiple cycles at high temperatures (sorption at 550°C and regeneration at 700°C). However, the CO_2 capture capacity of the LS2 sorbent decreased from 227.1 to 51.2 mg CO_2/g sorbent during the multiple cycles. To improve regeneration properties of the Li_4SiO_4 sorbent, novel Li_4SiO_4 -based sorbents were prepared by physical mixing the initial powder of the LS2 sorbent with various amounts of $-\text{Al}_2\text{O}_3$ and maintained their CO_2 capture capacities during the multiple cycles. In the cases of the Li_4SiO_4 -based sorbents added with $-\text{Al}_2\text{O}_3$, we found that LiAlO_2 plays an important role in improving regeneration properties. From these results, we conclude that the novel Li_4SiO_4 -based sorbents containing LiAlO_2 can be considered as a promising sorbents for CO_2 capture at high temperatures.