New preparation method of potassium-based δ-alumina sorbents for CO2 capture at low temperatures.

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CO_2 capture capacity of the potassium-based γ-alumina sorbents decreased dramatically during the multiple tests at sorption and regeneration temperatures of 60°C and 200°C, respectively. This result is due to the formation of by-product [$KAl(CO_3)_2(OH)_2$], which is an inactive materials. To improve the regeneration capacity during the multiple tests, we used the δ-alumina instead of γ-alumina as a support materials. A KAl(D)I40 sorbent was prepared by impregnation of δ-alumina with 40 wt% K_2CO_3 and a KAl(D)I40T sorbent was prepared by new preparation method. The regeneration capacity of the KAl(D)I40 sorbent is 72.6%, even though potassium-based sorbent using δ-alumina has better regeneration properties than that using γ-alumina as a support materials. On the other hand, the regeneration capacity of the KAl(D)I40T sorbent is 96.4%, resulting from the reduction in the formation of $KAl(CO_3)_2(OH)_2$ during the CO_2 sorption. Based on these results, we found that the regeneration capacities of the potassium-based alumina sorbents are affected by the structure of alumina and the preparation method.