Development of the regenerable Potassium-based TiO_2 sorbent for CO_2 capture at the low temperature

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Potassium-based sorbents were prepared by impregnation with K_2CO_3 on supports such as activated carbon (AC), TiO_2, Al_2O_3, MgO, SiO_2 and various zeolites. The CO_2 capture capacity and regeneration property were measured in the presence of H_2O in a fixed bed reactor (CO_2 capture at 60°C and regeneration at 130-400°C). Sorbents such as KACI, KTiI, KMgI, and KAlI, which showed excellent CO_2 capture capacity after the pretreatment in the presence of H_2O, could be completely regenerated above 130°C, 130°C, 350°C, and 400°C, respectively. In the case of KACI and KTiI, a $KHCO_3$ crystal structure was formed during CO_2 absorption, unlike KAlI and KMgI. This phase could be easily converted into the original phase during regeneration, even at low temperatures below 150°C. In particular, the KTiI30 sorbent developed in this study showed excellent characteristics in CO_2 absorption without the pretreatment of H_2O and fast and complete regeneration at a low temperature condition (1 atm, 150°C).