Absorption property of sodium-based ZrO_2 sorbents for carbon dioxide capture

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The sodium-based ZrO_2 sorbents were prepared by physical mixing of zirconium oxide (ZrO_2) with sodium carbonate (Na_2CO_3). The sodium-based ZrO_2 sorbents were calcined under the air for 5 h at various calcinations temperatures such as 700°C, 750°C, 800°C, 850°C, 900°C and 950°C. The CO_2 absorption and regeneration properties of the ZrO_2-based sorbents were investigated in a fixed bed reactor at CO_2 absorption of 200°C and regeneration of 400°C. The total CO_2 capture capacities of the sodium-based ZrO_2 sorbents (NaZr-900 and NaZr-950), which were calcined at 900°C and 950°C, were 131.6 and 130.1 mg CO_2/g sorbent, respectively, in the presence of 9 vol% H_2O at 200°C. The physical properties of the sorbents before and after CO_2 absorption were discussed by XRD and TGA.