

Amine-Grafted Y Zeolite: a Highly Regenerable CO₂ Adsorbent via Temperature Swing Process

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Solid adsorbents such as amine-included materials and zeolites have been widely investigated for post-combustion CO₂ capture. Amine-included porous materials have shown promising CO₂ uptake in a wet flue gas, but suffer from amine deactivation due to urea formation under a desorption condition (*e.g.*, desorption under pure CO₂ at the temperature higher than 130 °C) of temperature swing adsorption (TSA) cycles. In contrast, purely inorganic zeolites are thermochemically stable but do not adsorb CO₂ from a wet flue gas because of the preferential H₂O adsorption. In the present work, we synthesized an amine-grafted Y zeolite, which can synergistically combine the strengths of both adsorbent systems. The amine groups can effectively capture CO₂ in a wet flue gas, while the strongly co-adsorbed H₂O within the hydrophilic zeolite micropores suppresses urea formation. Because the adsorbent is prepared from a commercially available zeolite, it is also cost efficient and suitable for mass production.