A Comparative Study of Physical and Chemical Modification for Improved CO2 Capture in Fixed-Bed Adsorption

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Adsorption is a promising technique for CO2 capture, and improving adsorbent properties is crucial for enhancing CO2 selectivity. This study compares the efficiency and differences between two modification methods: physical treatment to increase mesopore volume and active sites, and chemical impregnation with triethylamine (TEA) for CO2 capture in a fixed-bed adsorption system. N2 isotherm analysis revealed an increase in mesopore volume for physically treated activated carbon. Conversely, BET surface area decreased for chemically impregnated samples with increasing TEA concentration, compared to the original activated carbon. Fixed-bed adsorption experiments demonstrated increased CO2 uptake with TEA-impregnated activated carbon, while physically treated carbon exhibited CO2 adsorption capacity similar to the original material. However, diffusivity in the fixed bed remained constant initially, but decreased with increasing TEA concentration due to pore blocking. Despite this, the study identified an approach for enhancing CO2 capture selectivity with a cost-effective preparation method that is scalable for industrial applications and real-world CO2 capture processes. [1-3]

References:

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