Influence of Tetraethylenepentamine-Acrylonitrile structures on carbon dioxide adsorption/desorption behavior in fixed bed column

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Adsorption CO2 characteristics depend on the type of amines. In general, the order of reactivity of amines type with CO2 is primary > secondary > tertiary. However, due to the high affinity to CO2, primary amines need large desorption energy to remove CO2. Tetraethylenepentamine(TEPA) which contains on average three secondary amines sites per molecule was used for CO2 chemisorption. To increase working capacity of TEPA molecules, we tried to modify the TEPA with acrylonitrile to substitute primary amine to secondary amine.
PMMA were used as support to confirm CO2 adsorption/desorption behavior and working capacity of sorbents. Fixed bed experiments were conducted with 4 cycle test, which operation conditions were adsorption at 75 ℃ (15% CO2, N2 balance) and desorption at 120 ℃ (90% CO2, N2 balance), respectively. The adsorption capacity was reduced compared to non modified TEPA impregnated sorbent (STEPA), but modified TEPA impregnated sorbent (ST3AN) showed higher thermal stability during cyclic test. Especially, the rate of adsorption/desorption of ST3AN was greatly improved prior to STEPA.