

Comparative study on zeolites, activated carbons and metal-organic framework materials for CO₂ adsorption

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Benchmark adsorbents, zeolites and activated carbons with different physicochemical properties were used for the adsorption of CO₂ at 25°C, and their adsorption capacities were compared to that of commercially-available metal-organic framework (MOF) materials. At a 840-Torr CO₂ pressure, the uptake was measured to be 7.94 and 4.10 mmol/g for the respective NaY zeolite and MSP-20 activated carbon, while all the remaining benchmarks showed CO₂ uptakes below 3.0 mmol/g although this value was greater than that of the commercial MOFs. Neither of the specific surface area, micro- and mesopore sizes, and pore volume were visibly associated with the indicated CO₂ uptakes. Based on the isotherms collected, it was shown that the extent of CO₂ adsorption with all the benchmarks seems to be reached to an endpoint of each uphill road at pressures near 1 bar or slightly greater, suggesting that these adsorbents may have a low working capacity for pressure swing separation.