

Adsorption of CO₂ on microporous materials with different surface heterogeneity at high pressures

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Microporous sorbents with different surface heterogeneity have been studied for CO₂ adsorption up to high pressures, such as 7.5 bar that is a common pressure of many industrial PSA systems. At 25°C, the extent of CO₂ adsorption strongly depended on the adsorbents used, zeolites, activated carbons (AC) and metal-organic framework (MOF) materials. The zeolites had the highest surface nonuniformity, while the surface of MOFs was relatively much less heterogeneous. The ACs disclosed an intermediate character between the zeolites and MOFs. Such difference in the surface features could be well correlated to distinctive CO₂ adsorption capacities among the sorbents. The measured uptake near 7.5 bar was the highest when an AC was used, while all MOFs showed the lowest CO₂ uptake at whole pressures allowed. These results could not be successfully explained by textual properties and microporosity of the adsorbents. It is proposed that microporous materials with moderate electric field potentials are better for CO₂ adsorption at high pressures.