

A Relationship between Framework Properties of Zeolites and Their CO₂ Adsorption

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The framework of zeolites and their Si-to-Al ratio (SAR), surface area (S_{BET}) and pore size have been correlated with the extent of CO₂ adsorption at 25°C. Zeolite 13X and NaY had lower SAR values than that for ZSM-5 and SSZ-13. All zeolites used here indicated micropore sizes in the range of 4.8 – 5.5 Å; thus, they all could allow a readily access of CO₂ with a molecular size of 3.3 Å even to the micropores. The extent of CO₂ adsorption depended on the framework type of the zeolites as a primary parameter. In general, Zeolites with FAU framework, such as NaY and 13X, exhibited larger CO₂ uptakes, compared to the other framework types. It seems that the SAR and S_{BET} could also result in difference in the adsorption capacity between the zeolites. SSZ-13, SAPO-34 and 13X possessed a comparable S_{BET} value each other; however, these zeolites showed visibly different CO₂ uptakes and this variable is minor in effecting the adsorption performance. Therefore, the framework basicity of zeolites, that increases as a SAR value becomes low, may determine significance in CO₂ adsorption.