

Development of CO₂ Selective Adsorbents using Lewis Acidic Zeolites

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[Abstract]

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The development of technology to capture, store, and utilize CO₂ (CCUS) is essential for achieving carbon neutrality, and the development of highly functional adsorbents for this purpose is strongly desired. In this research, zeolites, inorganic crystalline porous materials, were targeted, and CO₂ adsorbents were developed by controlling its composition, especially by introducing hetero-atom species into their frameworks. In particular, the CHA-type zeolite with a large amount of Zn introduced into the framework showed a significant improvement in the desorption rates, suggesting the possibility of low-energy regeneration of the adsorbents. The cost of the process including DAC was calculated, and the developed zeolite was compared with the reported adsorbents based on metal-organic-frameworks. The cost calculation of the process including DAC showed that there is a high possibility of cost reduction by using the developed zeolite compared to the state-of-the-art adsorbents.

[Reference]

1) R. Oishi, D. Li, M. Okazaki, H. Kinoshita, N. Ochiai, N. Yamauchi, Y. Kobayashi, T. Wakihara, T. Okubo, S. Tada, K. Iyoki: J. CO₂ Util., Precise tuning of the properties of MOR-type zeolite nanoparticles to improve lower olefins selectivity in composite catalysts for CO₂ hydrogenation, in press (2023) (IF:8.3)