Unseeded Hydroxide-Mediated Synthesis and CO_2 Adsorption Properties of an Aluminosilicate Zeolite with the RTH Topology

조동희, 임종빈, 류태경, 남인식, Miguel A. Camblor[1], 홍석봉†
포항공과대학교; [1]ICMM-CSIC
(sbhong@postech.ac.kr†)

We have synthesized an aluminosilicate RTH-type zeolite with Si/Al = 10 using 1,2,3-trimethylimidazolium (123TMI$^+$) as an organic structure-directing agent (OSDA) together with Na^+ or K^+ in hydroxide media and without the use of seed crystals. The obtained zeolite is characterized by a cuboid morphology made of very small, ill-defined crystallites, largely different from the plank-like morphology typically observed for RTH-type zeolite crystals thus far. More interestingly, we show experimental evidence demonstrating that two 123TMI$^+$ ions are located within each [$4^6 5^8 6^4 8^4$] cavity of the RTH framework, forming antiparallel dimers, as found by Rietveld refinement. When hydrothermally aged at 1023 K, Cu-RTH is much less active for NO reduction with NH_3 than Cu-SSZ-13, the best catalyst known for this reaction to date. However, while the CO_2 uptake (3.2 mmol g^{-1}) on Na-RTH at 298 K and 1.0 bar is lower than that (4.5 mmol g^{-1}) on zeolite Na-Rho, a well-studied small-pore zeolite that selectively adsorbs CO_2, it exhibits much faster CO_2 sorption kinetics. This renders our RTH zeolite potentially useful as a selective CO_2 adsorbent.