Pressure-mediated adsorption in 6-membered ring zeolites with EAB topology

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Abstract text

The intrusion of molecules or solvated ions into the nano-cavities of microporous materials, such as zeolites, through *P*-induced intrusion, has opened new opportunities for promoting mass transfer from fluids to molecules incorporated in framework structure. Understanding this phenomenon in natural or synthetic zeolites could expand their utilization, tailor new functional materials or improving catalytic abilities in industrial processes. In this study, we synthesized EAB samples using the Aiello-Barrer protocol (Aiello and Barrer 1970) and treated them to obtain the Na- and K-form. The high-pressure behaviour of the Na- and K- EAB zeolites has been then investigated using *in-situ* single-crystal and powder synchrotron X-ray diffraction, with a diamond anvil cell, at the ID15B beamline of ESRF in Grenoble, France. Additionally, high-pressure experiments were performed also on bellbergite (ideally $(K,Ba,Sr)_2Sr_2Ca_2(Ca,Na)_4[Al_3Si_3O_{12}]_6 \cdot 30H_2O$), the natural analogue of EAB zeolite. Distilled water, methanol, and the non-penetrating silicone oil were used as hydrostatic pressure-transmitting fluids. The results of this research allowed to understand the role played by the pre-existing extra-framework population in the adsorption of penetrating pressure fluids, and lead to a qualitative assessment of the fluid adsorption, by comparing the compressibility of these microporous crystal structures compressed in different *P*-transmitting media. Additionally, relevant high-pressure deformation mechanisms were described.

Reference

Aiello R. & Barrer R.M. (1970) - Hydrothermal Chemistry of Silicates. Part XIV, Zeolite Crystallization in presence of Mixed Bases, Journal of the Chemical Society A: Inorganic, Physical, 1470-1475.