

Effect of the Binary and Ternary Exchanges on Crystallinity and Textural Properties of X Zeolites

Authors : H. Hammoudi, S. Bendenia, K. Marouf-Khelifa, R. Marouf, J. Schott, A. Khelifa

Abstract : The ionic exchange of the NaX zeolite by Cu²⁺ and/or Zn²⁺ cations is progressively driven while following the development of some of its characteristic: crystallinity by XR diffraction, profile of isotherms, RI criterion, isosteric adsorption heat and microporous volume using both the Dubinin-Radushkevich (DR) equation and the t-plot through the Lippens-de Boer method which also makes it possible to determine the external surface area. Results show that the cationic exchange process, in the case of Cu²⁺ introduced at higher degree, is accompanied by crystalline degradation for Cu(x)X, in contrast to Zn²⁺-exchanged zeolite X. This degradation occurs without significant presence of mesopores, because the RI criterion values were found to be much lower than 2.2. A comparison between the binary and ternary exchanges shows that the curves of CuZn(x)X are clearly below those of Zn(x)X and Cu(x)X, whatever the examined parameter. On the other hand, the curves relating to CuZn(x)X tend towards those of Cu(x)X. This would again confirm the sensitivity of the crystalline structure of CuZn(x)X with respect to the introduction of Cu²⁺ cations. An original result is the distortion of the zeolitic framework of X zeolites at middle exchange degree, when Cu²⁺ competes with another divalent cation, such as Zn²⁺, for the occupancy of sites distributed within zeolitic cavities. In other words, the ternary exchange accentuates the crystalline degradation of X zeolites. An unexpected result also is the no correlation between crystal damage and the external surface area.

Keywords : adsorption, crystallinity, ion exchange, zeolite

Conference Title : ICCS 2016 : International Conference on Chemical Sciences

Conference Location : Montreal, Canada

Conference Dates : May 16-17, 2016