XIV ENCAT
Encontro de Catálise do Norte, Nordeste e Centro-Oeste
Catálise: Impulsionando a transição energética para um futuro mais sustentável
17-19 novembro 2024 • Fortaleza
SBCAT SOCIEDADE BRASILEIRA DE CATÁLISE

ÁREA: Síntese e caracterização de catalisadores e adsorventes

Diverting the crystallization route: magadiite-to-mordenite hydrothermal conversion

Rafael C. Lima[1,*], Joaquin Martínez-Ortigosa[2], Felipe F. Barbosa[1], Tiago P. Braga[1], Christian W. Lopes[3], Sibele B. C. Pergher[1]

[1]Laboratório de Peneiras Moleculares, Universidade Federal de Rio Grande do Norte (UFRN), Natal-RN, 59.078-970, Brasil)
[2]Instituto de Tecnología Química, Universidad Politécnica de Valencia), Valencia, Espanha)
[3]Laboratório de Catálise e Caracterização de Materiais, Universidade Federal do Paraná (UFPR), Curitiba-PR, 81.531-980, Brasil)
**E-mail: Rafael C. Lima (Ex. rafael_ibc@yahoo.com.br)*

Palavras-chave: magadiite, mordenite, conversion

Abstract

Layered solids have attracted significant attention due to their variety, being promising for modifications to produce different materials. Magadiite is a hydrous layered silicate already used as a silica source for obtaining zeolites [1]. However, its structure was recently solved [2], providing consistent information to the understanding of these modifications. Thus, this work studied an interconversion method to transform pure magadiite into zeolite mordenite. The synthesis method applied is distinct as it occurs in a single system through a stepped hydrothermal treatment, providing a new perspective on the phase transition. A gel was prepared by mixing the required amount of fumed silica, NaOH, and Na_2CO_3 in water. The gel was placed in an autoclave and subjected to thermal treatment at 150°C. After 48h, the autoclave was slightly cooled and opened to add aluminum triisopropylate in an amount to achieve a Si/Al ratio of 30 and treatment for 1.5-24h. The samples collected before this period were named “2d+Xh,” where “X” represents the time after the Al addition. Powder XRD patterns show a transition from magadiite directly to mordenite zeolite. ^{27}Al NMR spectra show that Al(IV) presents four sites assigned to free species, magadiite, intermediate, and mordenite. N_2 Isotherms show that the layered non-porous initial structure undergoes a rearrangement, reducing the interparticular porosity, until a typical microporous isotherm. Magadiite was converted into mordenite by adding aluminum to the system in an unexpected route from the point of view of theories of crystallization of metastable phases.

References

1. Yu W, Yunshuai S, Jian W, Jiang Z, Yang Y, Changgong M. *J. Chem. Tech. Biotech.* 2010;85(2):279–82.
2. Krysiak Y. et al. *Chem. Mater*. 2021;33(9):3207–19.

Knowlegements

Rafael C. Lima thanks CAPES for the doctorate scholarship