NANOSTRUCTURED MESOPOROUS MATERIALS MODIFIED WITH NICKEL FOR ALTERNATIVE ENERGY AND ENVIRONMENTAL APPLICATIONS.

P. M. Carraro [1,2], T. B. Benzaquén [1], M. I. Oliva [2], G. A. Eimer [1].

[1] CITeQ – CONICET – UTN, Universidad Tecnológica Nacional - Facultad Regional Córdoba, Maestro López esq. Cruz Roja Argentina, Córdoba, Argentina. pcarraro@frc.utn.edu.ar
[2] IFEG – CONICET – UNC, Universidad Nacional de Córdoba, Medina Allende s/n, Córdoba, Argentina. carraro@famaf.unc.edu.ar

Keywords: MCM-41, nickel, hydrogen storage, atrazine degradation.

ABSTRACT

Nickel modified mesoporous silicas with MCM-41 structure were prepared by direct hydrothermal synthesis with Si/Ni molar ratio = 20 and 60 in the synthesis gel and increased days of synthesis from 0 to 7 days. Various characterization techniques including XRD, N_2 adsorption at 77 K, TEM, SEM, ICP-OES, UV-Vis DRS, TPR, FT-IR and adsorption of pyridine coupled to FT-IR spectroscopy were conducted in order to study the textural, structural and chemical properties of the materials. The effect of Ni loading on the textural, structural, adsorbing and catalytic properties of the materials was investigated.
The samples presented well-ordered hexagonal structure; however, the structural ordering appears to be slightly decreased when increasing the hydrothermal treatment days. A hydrothermal treatment time of 3 days appears optimum to obtain a good ordering and Ni species incorporation into the structure. Longer hydrothermal treatment times decreased the degree of ordering structural, giving account for the restructuration and reorganization of the network. Thus, combined characterization results indicate that the synthesis time has an important influence on the textural, structural and chemical properties of the nickel modified mesoporous silica [1].
Hydrogen adsorption capacity of Ni-containing mesoporous materials modified with nickel was measured at 77 K up to 10 bar. The results demonstrated that the sample with a molar ratio Si/Ni = 60 and without hydrothermal treatment presented the highest hydrogen adsorption, probably due to their S_{BET} and the presence of highly dispersed nickel species on the support [2].
Besides, the mesostructured nickel-containing catalysts have been successfully proved in Atrazine degradation by the heterogeneous photo-Fenton process in aqueous solutions. As a result of this, the sample with nickel loading of 1.6 wt. % (Ni(60)0) allowed to reach values of the pollutant degradation about of 60.3 % [3].
In conclusion, the nickel incorporation into the mesoporous framework presents the option of developing materials versatile and efficient for to be employed in energy and environmental applications.

Presentation format: ___ Oral __x_ Poster
Language of presentation: ___ Spanish __x_ English

References

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