11th International Conference
on Advanced Materials
Rio de Janeiro Brazil
September 20 - 25
ICAM2009

SnO_2:Ni supported on bentonite for biodiesel synthesis

N. P. Sá[(1)*], L. E. B. Soledade[(1)], J. A. R. Carvalho[(1)], H. B. Sales[(1)], A. A. Silva[(2)], A. G. Souza[(1)], I. Garcia[(1)]

(1) LACOM - DQ, Universidade Federal da Paraíba, Campus I, João Pessoa, PB, Brazil, e-mail: natanpires_sa@hotmail.com
(2) BENTONISA - Bentonita do Nordeste S.A., João Pessoa, PB, Brazil
* Corresponding author.

Abstract – The mineral clay bentonite was used as support for SnO_2 impregnation, for biodiesel synthesis. The bentonite was characterized by infrared spectroscopy (IR), X-ray diffraction (XRD), termogravimetry (TG). The SnO_2:Ni (5 and 10 mol %) resins were synthesized by the polymeric precursor method, deposited on bentonite, calcined at different temperatures and characterized again. Calcination at 700 °C does not change the clay structure, while leads to the crystallization of the catalyst with rutile structure and favors the reaction between support and catalyst. Acknowledgements: The authors acknowledge the financial support of CNPq/MCT and FINEP/MCT

Tin dioxide has been used in the synthesis of biodiesel after impregnation with sulfate ions, as homogeneous catalyst in the form of complexes or in the reduced form, SnO [1, 2]. In this work, pure and nickel doped SnO_2 (5 and 10 %) were synthesized by the polymeric precursor method and deposited on bentonite to obtain a thin film of the catalyst on a clayish support, for biodiesel applications. Bentonite, with and without SnO_2 deposition, was calcined at 400, 500, 600 and 700 °C for 4 h, and characterized by infrared spectroscopy (IR) and X-ray diffraction (XRD).

IR spectra (Fig. 1) of pure bentonite showed the presence of OH^- group around 3618 and 3450 cm^{-1}, assigned to H_2O adsorbed on smectite. Si-O vibrations occurred around 1050 and 470 cm^{-1}, Si-O-Al vibrations at 525 cm^{-1} (quite definite at 700 °C) and Mg-Al-OH at 800 cm^{-1}. No meaningful change was observed with temperature increase. This result was confirmed by XRD patterns (Fig. 2), which showed intense peaks assigned to quartz (Q), montmorillonite (M) and illite (I). As in infrared spectra, no meaningful change was observed with heat treatment, indicating that calcination can be done without changing in the support structure.

After impregnation of the bentonite with SnO_2 and calcination at different temperatures, the band assigned to Si-O-Al and Si-O vibrations were dislocated to a higher wavenumber, especially after calcination at 700 ^oC, confirming the deposition of the SnO_2 film on the support. At this temperature, one band around 700 cm^{-1} assigned to SnO_2 was also observed, indicating that the catalyst was already ordered. This temperature was chosen for further calcinations, as support structure was not changed while catalyst was already crystalline, as confirmed by X-ray diffraction.

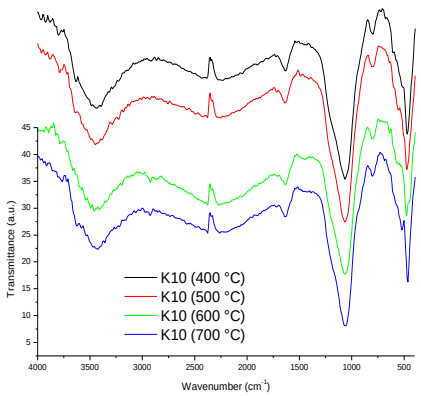

Figure 1: IR spectra of the bentonite calcined at different temperatures.

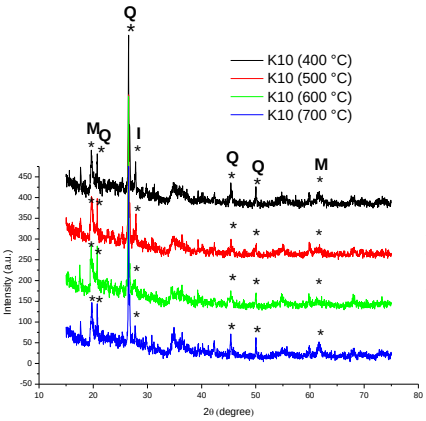

Figure 2: XRD patterns of the bentonite calcined at different temperatures.

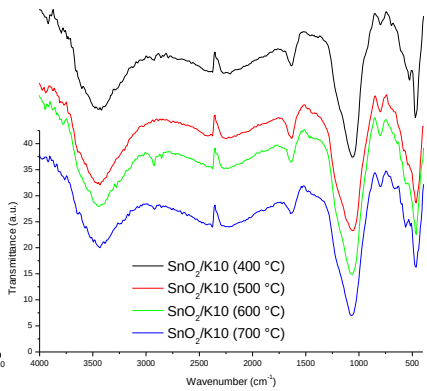

Figure 3: IR spectra of the SnO_2/support calcined at different temperatures.

References

[1] F.R. Abreu et al. Journal of Molecular Catalysis A: Chemical 227 (2005) 263–267
[2] J. Jitiputti. Chemical Engineering Journal 116 (2006) 61–66