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# $SnO_2$ Supported on Vermiculite for Biodiesel Production

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**Abstract** – $SnO_2$ supported on vermiculite clay [$(MgFe,Al)_3(Al,Si)_4O_{10}(OH)_2.4H_2O$] was synthesized for the transesterification of soybean oil to biodiesel. The XDR patterns and IR spectra indicate the impregnation of the lixiviated and non-lixiviated vermiculite with $SnO_2$ phase, with cassiterite structure. The fluorescence results showed that the impregnation process was adequate for both clays.

Biodiesel production is based on the vegetable oil or animal fat transesterification, using homogeneous or heterogeneous catalysts [1]. Even though, the heterogeneous-based processing present slower conversions compared to homogenous ones, such process leads to non-corrosive manufacturing and avoid the occurrence of saponification reactions [2]. Thus, this work aims to evaluate the catalytic activity of the $SnO_2$ supported on vermiculite clay [$(MgFe,Al)_3(Al,Si)_4O_{10}(OH)_2.4H_2O$] for the transesterification of soybean oil. The several catalysts were obtained by impregnation of the lixiviated and non-lixiviated vermiculites with a resin previously synthesized by means of the Polymeric Precursor Method [3]. All the samples were characterized by infrared and UV-visible spectroscopies, X-ray diffraction, scanning electron microscopy and X-ray fluorescence. The biodiesel were synthesized using a molar ratio of 1:10 (soil bean oil:ethanol) and 5.0 % (wt/wt) catalyst, at 65 ℃. The XDR patterns indi cated a significant impregnation of the lixiviated and non-lixiviated vermiculite with $SnO_2$ phase (as cassiterite), besides a meaningful change in the vermiculite structure (Figure 1). Such results were in agreement with the IR data, which showed absorption bands at 3500 $cm^{-1}$, attributed to O-H stretching vibrational mode and O-H bending modes (1624 - 1642 $cm^{-1}$) of constitutional water. Also, Sn – O – Sn symmetric modes were detected at 500 – 700 $cm^{-1}$ (Figure 2). The FRX results showed that the impregnation process was adequate for both clays (Table 1).

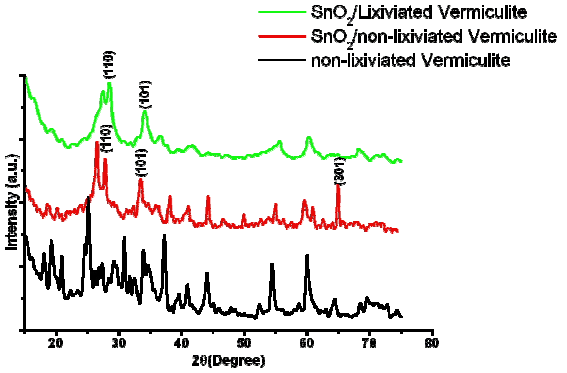


**Figure 1:** XRD patterns of the vermiculite with and without $SnO_2$ impregnation

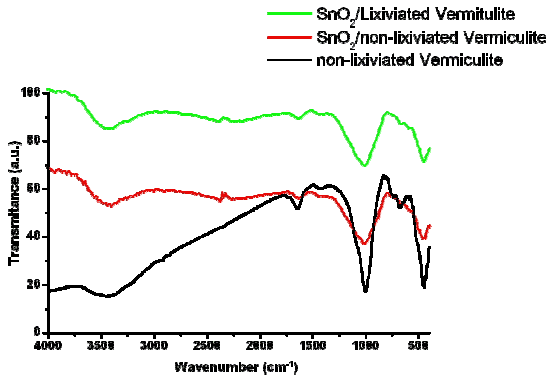


**Figure 2:** IR spectra of the vermiculite with and without $SnO_2$ impregnation

**Table 1:** FRX results, showing the amount of $SnO_2$ supported on vermiculite

| Sample | $SnO_2$ impregnation (%) |
|---|---|
| $SnO_2$/lixiviated vermiculite | 8.4 |
| $SnO_2$/non-lixiviated vermiculite | 8.7 |

## References

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[3] D. S. Gouveia, L. E. B. Soledade, C. A. Paskocimas, E. Longo, A. G. Souza and I. M. G. Santos, Mater. Res. Bull. 41 (2006), 2049 – 2056.