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PREPARATION AND CHARACTERIZATION OF MOLYBDENUM OXIDE AND NEODYMIUM THIN FILMS GROWN BY SPRAY PYROLISIS TECHNIQUE

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Abstract –

Molybdenum oxides are of great technological interest because of their optical properties among which stands out the capability to switch between two optical states [1] Additionally, they present electric properties that make them suitable cathodes in micro batteries, due to the insertion and extraction of alkaline ions in their structures [2]. Molybdenum oxide thin films are being used as gas detectors thank to their electric response [3] On the other hand, rare earth molybdates present important physical-chemical properties such as catalytic and thermal activities. The study of the latter property has allowed establishing that molybdates present a negative thermal expansion coefficient .

Molybdenum oxide thin films doped with neodymium (MoO3:Nd) have been grown in this work, using the spray pyrolysis technique from tetra-hydrated ammonium molybdate ($(NH_3)_6Mo_7O_{24}.4H_2O$) and neodymium nitrate. The procedure consisted of spraying ammonium molybdate and neodymium nitrate aqueous dissolutions on glass substrates heated up to temperatures between 523 and 673K. Air at 2.02 $x10^5$ Pa was used as carrier. Layer thickness was varied by spraying dissolution volumes between 5.0 and 30.0 ml. Neodymium nitrate was prepared by adding nitric acid dissolution onto neodymium oxide Nd_2O_3 (Aldrich). The concentration of cations Mo^{6+} y Nd^{3+} in the sprayed dissolution was 0.1 M.

The obtained film's crystallography was characterized through X-Ray Diffraction (XRD) and their morphology through scanning electron microscopy (SEM). XRD preliminary results show that, for all sprayed volumes, non stoichiometric oxygen deficient phases were grown, for instance: Mo_9O_{26} (PDF120753) and $Mo_{18}O_{52}$ (PDF741664).SEM results show the films' morphology as highly rugged with coral-like surface structure and grain sizes between 5 and 40 nm.

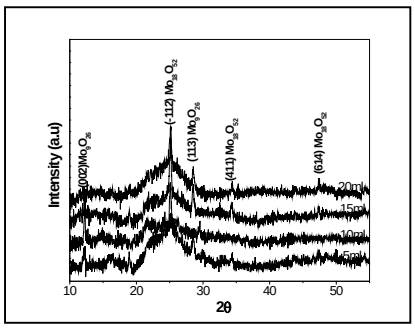

Figure 1: XRD pattern of the MoO3: Nd thin films..

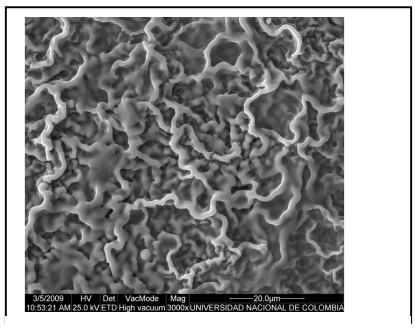

Figure 2. The SEM micrograph of the MoO3 :Nd Thin Films.

References

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