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Microwave-hydrothermal method used to prepare molybdates nanostructures

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Abstract – The synthesis of luminescent $BaMoO_4$ nanostructures prepared by microwave-hydrothermal method, your morphology and optical properties were the objectives in this work. These powders were submitted to the thermal treatment at 100°C for 16 min. The scheelite-type crystalline structure was confirmed by X-ray diffraction (XRD), Field–Emission Scanning Electron Microscopy (FEG-SEM), Raman spectroscopy and Fourier transformed infrared (FTIR) spectroscopy. The PL intensity is linked to the thermal treatment history, therefore, to the synthesis method.

Microwave-assisted hydrothermal synthesis is an attractive growth method of single crystals. This new method provides some advantages as low synthesis temperatures and uniform rapid heating. The microwave energy accelerates the formation of well-organized nanostructures. Materials with scheelite-type crystalline structure lies in their excellent optical properties, which form the basis of their wide use as phosphors, laser materials, and scintillation detectors [1, 2]. $BaMoO_4$ (BMO) belonging to this family attracts great attention due to its property of producing green luminescence. BMO nano-size structures were produced by a fast and simple synthesis method. In this work, BMO powders were obtained with and without microwave-hydrothermal conditions. In order to study the structural and optical properties and the morphology, these powders were characterized by X-ray diffraction (XRD), FTIR, Field–Emission Scanning Electron Microscopy (FEG-SEM) and photoluminescence spectroscopy. The both samples present the scheelite-type crystalline structure by X-ray diffraction (XRD), according to JCPDS data base n° 29-0193. The crystalline phase was confirmed by Raman and FTIR. The FEG-SEM micrographs show different morphologies for the synthesized BMO samples. The photoluminescent (PL) emission suggested that the sample treated without microwave-hydrothermal conditions presents higher short-range disorder than the sample treatment by microwave-hydrothermal process. This simple method can be probably expanded to produce others materials with novel morphologies and different properties.

Figure 1: Field–Emission Scanning Electron Microscopy (FE-SEM) micrograph of $BaMoO_4$ nanostructures obtained under microwave-hydrothermal conditions.

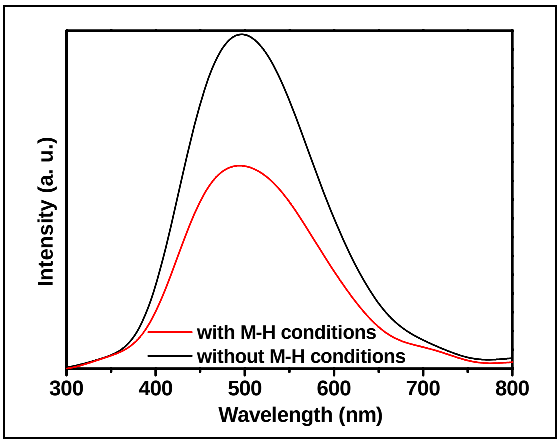

Figure 2: Emission spectra of the $BaMoO_4$ nanostructures, where M-H: microwave-hydrothermal conditions $\lambda_{Exc.}$= 350.7 nm

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