Synthesis and characterization of bismuth oxide nanoparticles for the production of thin films

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Nano and micromaterial research, with a well-defined size and shape, has attracted attention from researchers in the fields of chemistry, physics, engineering and biomedicine, due to the wide range of possible applications such as health, environment, catalysts and miniaturization of electronic devices. In this sense, the chemical routes of synthesis have a great prominence due to the control of particle size and morphology and the excellent chemical homogeneity of the final product. The bismuth oxide nanoparticles have optical and electrical properties, such as a large energy bandwidth, a high refraction degree, dielectric permittivity and photoconductivity, and can be used in optoelectronic devices, sensors, photovoltaic cells, semiconductor-metal-insulators, integrated circuits of microwaves, besides presenting bactericidal, fungicidal and antiviral properties. The nanoparticles of bismuth oxide were synthesized by the sol-gel method, part of the samples were dispersed on a glass surface with the aid of a Spin coater, and obtained in powder after calcination. The samples were characterized by X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Dispersive Energy Spectroscopy (EDS) and Raman Spectroscopy. The XRD spectra and the Raman vibration bands show that the synthesized samples correspond to the bismuth oxide in the $\alpha-Bi_2O_3$ phase, the SEM images show that the particles have spherical morphology and good size distribution, where the dispersed sample particles have a diameter between 80 and 100 nm, whereas the particles of the powder sample have a diameter of 0.7 and 1.0 $\mu$m, and the results of EDS show that the constituent elements of the samples are bismuth and oxygen, without the presence of contaminating elements.