Synthesis and characterization of tin oxide nanoparticles

Juliana Silva Dias[1], Rebeca Bacani[2], Eduardo Rezende Triboni[1]

[1]Universidade de São Paulo, Escola de Engenharia de Lorena (*DEQUI*) ,
[2]Universidade de São Paulo, Escola de Engenharia de Lorena (*DEMAR*)

e-mail: juliana.silva.dias@usp.br

Tin oxide is a significant type p semiconductor with several important applications since photovoltaic cells, optoelectronics, catalysts, lasers and gas sensors [1,2]. Nanoparticles are known to display several unique and tailoring characteristics depending on shape and size. The synthesis control of the morphology, structure and size systems is extremely important in order to control its properties [3]. In this work two synthetic methods were explored, which were the hydrothermal and the microwave method. The method consists in adding 0.5 M of $SnCl_2$.$2H_2O$ dissolved in the aqueous solution of 0.5 M of HCl, placed in a 300 ml three-necked reaction flask under constant stirring at room temperature and argon injection. Then NH_4OH was added dropwise to reach a pH around 8. Then, the solution formed was divided and placed in two Teflon autoclaves. One autoclave was placed in a Titan MPS (Microwave Sample Preparation - PerkinElmer) at 80 °C for several different times. The other autoclave was placed in a conventional oven at 100 ºC for several times. The resulting materials for both methods were filtered and washed with distilled water. Characterization of the SnO nanoparticles was performed with X-Ray Diffraction (XRD) and Transmission Electron Microscopy (TEM) for structure and morphology respectively. Results for XRD with Rietveld analysis and TEM showed the microwave synthesis presented 100% of single tetragonal SnO phase after 1h of treatment and nanoparticles around 5 nm with spherical shape. While the hydrothermal method, the SnO only was formed after more than 2h, with formation of several elongated structures and aggregates without a defined shape.

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