EVALUATION OF THE USE OF DIFFERENT PRECURSORS TO OBTAIN NB_2O_5 BY MICROWAVE-ASSISTED HYDROTHERMAL SYNTHESIS

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Dye-sensitized solar cells (DSSC), proposed by Grätzel in 1991, are considered a low-cost, easy to manufacture photovoltaic technology. Within the numerous semiconductors used in DSSC, niobium pentoxide (Nb_2O_5) has interesting optical and electrical properties, and is widely available for use, proving to be a convenient material in photovoltaic technology. Based on this, in this work Nb_2O_5 was synthesized through microwave-assisted hydrothermal method, at low temperature and a short time interval testing two different niobium precursors, ammonium oxalate of niobium (P1) and niobium pentachloride (P2) (both supplied by CBMM), together with distilled water and hydrogen peroxide, in order to characterize and analyze the properties in the final product. The obtained powder was submitted to different thermal treatments (500-800 °C), since the temperature influences the phase change of the material, passing from the pseudohexagonal (TT) phase to the orthorhombic phase (T). A difference in the morphology of both synthesis is observed, through the scanning electron microscopy, where the samples from P1 presented different sizes and formats, while P2 presented regular sizes and formats. The band gap values of the samples of both precursors presented different responses as the temperature of the heat treatment increased. In the synthesis using P1, the band gap values were lower than the values using the precursor P2. For samples from P1, at 700 °C and 800 °C, the values found were 3.08 eV and 3.04 ev, corresponding to the wavelengths of 402.3 nm and 407.6 nm, indicating that they absorb light in the visible spectrum, region of higher solar utilization, different from band gap values found for P2 at the same temperatures, which were 3.22 eV and 3.23 eV, referring to the UV region of the solar spectrum.

Niobium pentoxide, heat treatment, microwave-assisted hydrothermal method, DSSC, band gap