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Solvent and pH implication on the synthesis of CuBi2O4 as photocatalyst for various applications

Climate change, water scarcity, energy shortages and hard-to-remove pollutants are now the vanguard of menacing risks not just for human kind but, other lifeforms, ecosystems and the planet itself. In response, the human race has devoted an uncountable number of efforts to diminish the effect of these harmful phenomena, including novel water purifying technologies, advanced oxidation processes to eliminate pollutants, health care products environmentally compatible and alternative energy production methods. Another exceptional alternative is photocatalysis which has a wide range of application in environment remediation. Low studied catalyst such as CuBi2O4 is regarded as propitious one due its narrow band gap (1.2 -1.6 eV) suitable conduction and valence band edges, low recombination rate, high photo and chemical stability and economic viability. In this work, it was studied the relationship between solvent and pH modulation and pure phase obtention in the synthesis process. CuBi2O4 was synthesized by a standard solvothermal reaction (180 °C, 10 h) using bismuth nitrate (Bi(NO3)3) and copper nitrate (Cu(NO3)2) as Bi and Cu sources, respectively. The solvent used in the reaction was varied, water (H2O), Ethanol (ET), Ethylene Glycol (EG) and Glycerol (GLY), and pH values, acidic (2), neutral (8) and basic (14). The characterization techniques employed were X-Ray Diffraction (XRD), Diffuse Reflectance Spectroscopy (DRS) and Fourier Transform Infra-Red (FTIR). Pure phases were obtained with almost all solvents, being the ones with water, the most crystalline. Samples synthesized with non-basic pH values did not show a single-phase diffraction pattern, indicating the presence of reagents. FTIR spectra corroborated XRD results. The bandgap of the samples was estimated by DRS and the Kubelka-Munk theory, values were found in the 1.2 –1.6 eV range.

Keywords

copper bismuthate, photocatalysis, solvothermal, pH moduletion

Reference

S. Yuvaraj, K. Karthikeyan, D. Kalpana, Y. S. Lee, and R. K. Selvan, Surfactant-free hydrothermal synthesis of hierarchically structured spherical CuBi2O4 as negative electrodes for Li-ion hybrid capacitors, Journal of Colloid and Interface Science.469, (2016)47–56 https://doi.org/10.1016/j.jcis.2016.01.060.

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Author approval

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