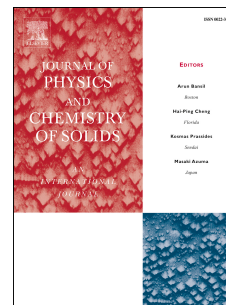


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Influence of reaction conditions on formation of ionic liquid-based nanostructured Bi₂O₃ as an efficient visible-light-driven photocatalyst

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ABSTRACT

In this study, nanostructured bismuth oxide was synthesized based on the chemical reaction of bismuth nitrate and NaOH in the ionic liquid 1-butyl-3-methylimidazolium chloride ([C₄mim]Cl) under ultrasonic irradiation. The effect of sodium hydroxide with a different molar ratio of NaOH to bismuth in the range of 3 - 10 was investigated. The results of FT-IR and XRD showed that NaOH has a critical role in the formation of pure α -Bi₂O₃. So, at high concentrations of NaOH (NaOH:Bi \geq 7.5), the chloride anion from the ionic liquid cannot be entered into the crystalline structure of bismuth oxide, which resulted in the formation of pure bismuth oxide, while at lower concentrations of NaOH (NaOH:Bi \leq 5), Bi₃O₄Cl was formed with a layered structure. The XRD results revealed that the synthesized α -Bi₂O₃ has a monoclinic structure and SEM images showed that the sample consists of needle like particles with an average thickness of 50 nm. The ionic liquid has an important role in the prevention of an agglomeration of particles in the Bi₂O₃ sample. The photocatalytic activity of the synthesized Bi₂O₃ was investigated to study the degradation of malachite green dye as a model pollutant under visible light. The effects of various parameters such as the pH, concentration of the dye, and the catalyst on the degradation of malachite green were also investigated.

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