

Photoluminescent and photocatalytic properties of bismuth doped strontium aluminates blended with titanium dioxide.

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Abstract

Bismuth co-doped long persistent phosphor (LPP) powders were obtained by a combustion synthesis technique followed by a post-annealing under carbon atmosphere. Bismuth content was varied from 1.0 to 15.0 mol%. X-ray diffraction analysis revealed that the powders show mainly a mixture of three phases: the SrAl₂O₄, the SrAl₁₄O₂₅ and the Sr₂Al₆O₁₁ crystalline phases. Photocatalyst composites were obtained by wet mixing of TiO₂ anatase and LPP powders followed by annealing in air at 450 °C. Photoluminescence measured spectra under 380 nm excitation show a tunable emission from green (510 nm) to greenish-blue (463 nm) in which peak wavelength localization is related to the Bi content. Photoluminescence intensity decreases as Bi content increases. Degradation of methylene blue solutions, irradiated by UV light (254 nm), was monitored by the decrease of its 650 nm absorption peak in regular periods. The best photocatalytic activity is observed when in the composite blend a 2.0 mol% of Bi content was used, and complete methylene degradation is reached after 210 min. These photocatalyst composite powders are potential candidates to clean-up wastewater applications, and might be potential candidates for photocatalytic hydrogen generation in aqueous solutions.