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Heavy metal waste treatment product as semiconductor: efficient visible light photocatalytic activity of the Bismuth(III) chelates

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Abstract

Trithiocyanuric acid trisodium salt hydrate (Na_3TMT) has been proved an excellent heavy metal chelating agent and widely applied for heavy metal ions elimination in industrial wastewater. In this work, the chelating products of Bismuth(III) ion with this effective agent were prepared by solid state and liquid phase reactions, and proved as a new kind of n-type semiconductor. For full utilization of resource, the green and low-cost massive Bismuth chelate with good crystallinity, distinctive morphology, appropriate band structure and high stability was applied for photoelectrochemical application and photocatalytic organic pollutants degradation upon visible light. Results indicated that •OH radicals were the main reactive specie in the photodegradation process. The combination of heavy metals and organic contaminants removal was achieved by a waste-to-wealth route.

Keywords: Trithiocyanuric acid trisodium salt, Bismuth chelate, heavy metal removal, photocatalysis