A Novel Approach for Controlling Structure and Size of AgX Nanostructures and Its Application for Visible light-Driven Photocatalyst

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Abstract (Arial 10)

Ag/AgX (silver/silver halide) has been supposed to be new visible light photocatalytic materials due to its good sensitivity to sunlight. The Ag/AgX catalysts display high photocatalytic activity and stability under visible light irradiation due to the SPR of silver nanoparticles produced at the surface of AgX.[1-2] Recently substantial efforts have been focused on the synthesis of Ag/AgX photocatalysts with high performance using facile and versatile methods.[3-4] However, most of photocatalysts prepared by reported methods are formlessness or spherical structure with irregular shape. Relatively little attention has been directed to controlling structures of photocatalysts into well-defined structure. It has been well-known that nanomaterials with well-defined structures can exhibit unique properties which are not observed in bulk or nanomaterials with irregular structures. Herein, we report a novel approach for controlling structure and size of AgX structures. We report CTAB-decorated AgBr microplates (MPs) that are obtained by mixing silver precursor with hexadecyltrimethylammonium bromide (CTAB) under controlled conditions. By appropriate polyelectrolytes (PEs) coating, it is able to transform structure of AgBr MPs into submicrometer-sized spherical or cubic shape with controlled sizes. We believe that the PEs which posses certain types of functional groups are the crucial factors that control the structure and size of the AgBr MPs. The size and shape-controlled AgBr cubic NPs can be used as plasmonic photocatalysts for the degradation of methylene orange (MO) dyes that are well known for toxic substances under sunlight irradiation.

References

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Figures

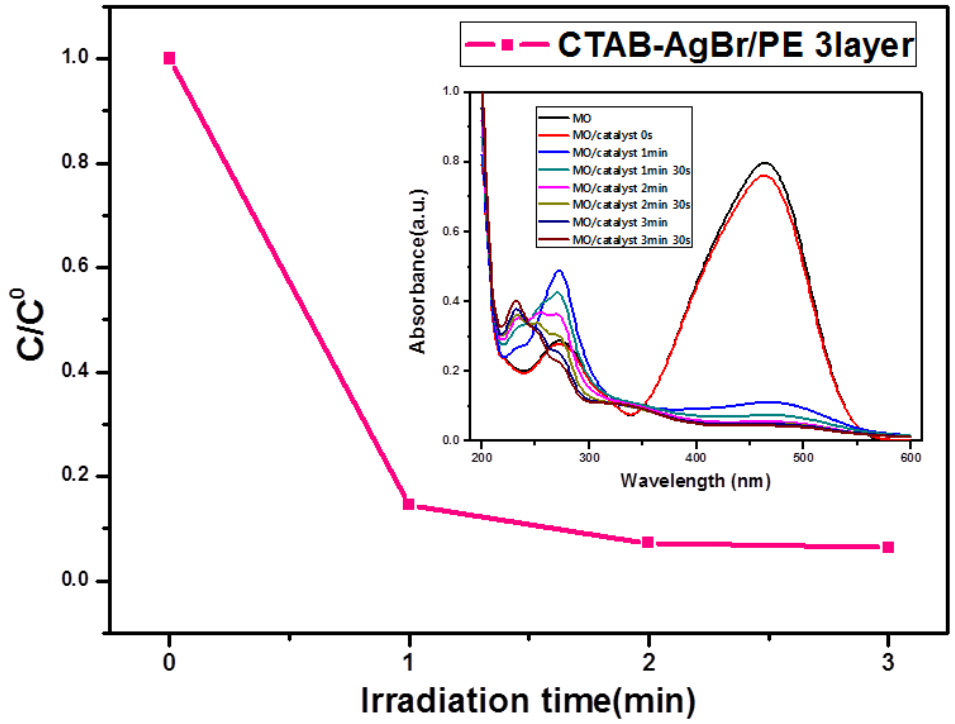

Figure 1. Photocatalytic activity for the degradation of MO dye under visible light irradiation. Inset show the UV-visible spectra changes of MO dye as a function of reaction time.