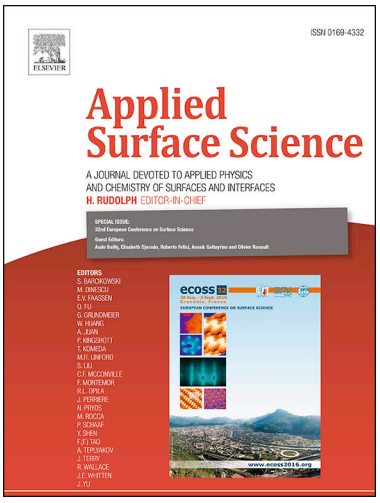

Full Length Article

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Carbon and Nitrogen Co-doped Bowl-like Au/TiO_2 Nanostructures with Tunable Size for Enhanced Visible-Light-Driven Photocatalysis

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Abstract: It is of great importance to extend the UV response of anatase TiO_2 into the visible light range for the practical applications. Here, a facile rout to carbon and nitrogen co-doped, Au loaded bowl-like TiO_2 nanostructures with tunable size are proposed by using self-assembled polystyrene-*block*-poly(4-vinylpyridine) (PS-*b*-P4VP) block copolymer (BCP) spherical micelles as templates. Amphiphilic PS-*b*-P4VP self-assembles to form PS@P4VP core-shell spherical micelles with P4VP as the out layer in an evaporable mixed solvents of ethanol/tetrahydrofuran (THF). The size of uniform PS@P4VP spherical micelles can be precisely tuned in the range of a few nm to several hundred nm by controlling the molecular composition of the BCPs. Bowl-like TiO_2 nanostructures with a replicate size loaded with highly dispersed Au nanoparticles (NPs) of ~ 5 nm in diameter are fabricated from these spherical micelles because of strong complex ability of pyridine groups. PS-*b*-P4VP provides carbon and nitrogen sources to dope the resulting samples simultaneously. The special carbon and nitrogen co-doped bowl-like Au/TiO_2 nanostructures exhibit much higher photocatalytic activity in the photodegradation of rhodamine B (RhB) compared to Au/P25 under visible light irradiation. Furthermore, the photocatalytic activity is significantly influenced by the BCP molecular composition due to different surface area and loading capacity of the resulting samples. This study provides a facile way to synthesize multi-element doped hollow or bowl-like nanoparticles with tunable size in the nanometer range which have potential application at photocatalysis, oxygen reduction reaction, etc.