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Enhanced photocatalytic degradation of bisphenol A with Ag–decorated S–doped g–C_3N_4 under solar irradiation: Performance and mechanistic studies

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Abstract:

Ag–decorated S–doped g–C_3N_4 composites with different % w/w Ag were synthesized *via* chemical reduction method. The Ag/S–doped g–C_3N_4 composites were used as photocatalysts for aqueous bisphenol A (BPA) degradation under solar irradiation. Investigation of the photocatalysts using various characterization methods including X–ray diffractometry, scanning electron microscopy and transmission electron microscopy indicated that the Ag nanoparticles (average size = 10–20 nm) were well–crystalline and uniformly distributed on the S–doped g–C_3N_4 (SCN) surface. The photocatalytic performance of SCN was ~3 times more efficient than that of the g–C_3N_4, while the Ag/SCN with 12% w/w Ag (Ag–SCN–12) exhibited the highest photocatalytic activity for BPA degradation followed by 8% w/w Ag/SCN, 4% w/w Ag/SCN, SCN, and Ag. The effects of pH and Ag–SCN–12 loading on photocatalytic BPA degradation were also investigated. The results showed that the Ag–SCN–12 was highly stable (<40 μg L^{-1} Ag leaching) and could be reused for at least 4 cycles without significant deterioration to its catalytic activity. The incorporation of Ag into the SCN enhanced the photocatalytic activity of SCN due to the improved electron–hole pair separation and decreased electron–hole pair recombination rate as evidenced by the photoluminescence emission study. The predominant reactive oxygen species (ROS) generated by the Ag–SCN–12 photocatalytic system was $O_2^{\bullet-}$ which formed secondary ROS