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Visible light photocatalysis of Methylene blue by graphene-based ZnO and Ag/AgCl nanocomposites

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ABSTRACT

The present investigation deals with the photocatalytic activity of two different graphene oxide-(GO) based nanocomposites i.e. Ag/AgCl/GO and ZnO/GO for the degradation of Methylene blue (MB). The composites were prepared by low-temperature hydrothermal method and were characterized using scanning electron microscope (SEM), X-ray diffraction (XRD), and Raman spectroscopy. SEM analysis showed that GO was stacked between the hexagonal ZnO nanostructures and in the case of Ag/AgCl, it was grafted onto the distorted spheres of Ag/AgCl. This distorted structure may be due to the overloading of the silver precursor close to the saturation during the synthesis. XRD pattern confirms the formation of both the nanocomposites. Both the nanocomposites showed good performance in degrading the dye under sunlight. ZnO/GO being a semiconductor photocatalyst showed 95% removal of dye in 100 min, whereas plasmonic catalyst Ag/AgCl/GO was found to degrade 92% of MB within 50 min of reaction time due to its unique surface plasmon resonance property. Raman spectroscopy confirms the enhanced photocatalytic activity of both the nanocomposites, which is due to the electron-accepting property of the GO and hinders the recombination of electron–hole pair.

Keywords: Methylene blue; Visible light; Graphene; Surface plasmon resonance; Photocatalyst

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