

Design of defective silver phosphate photocatalyst using Nigella sativa seed aqueous extract for enhanced photocatalytic activity

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Abstract	<p>New properties of the Ag₃PO₄ material have been successfully designed through surface modification of the material using natural extracts of Nigella sativa seeds. This research aims to induce changes in the band gap, defects, and atomic composition on the surface of Ag₃PO₄ through the coprecipitation method with Nigella sativa seed aqueous extract (NSE). The mixture of phosphate ion solution and NSE was reacted drop by drop with silver ion solution followed by aging treatment. The synthetic products were characterized using XRD, FE-SEM, FTIR, DRS, PL, Raman, and XPS. Rhodamine B dye was used as a target pollutant for photocatalytic evaluation. The results showed that NSE significantly induced changes in the band gap energy, defects, and atomic composition in the Ag₃PO₄ surface. The photocatalytic rate of Ag₃PO₄ treated with NSE increased up to 11 times higher than that of samples without NSE. This extraordinary activity is mainly due to the presence of active hole species in the valence band.</p>
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