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HETEROSTRUCTURES OF SILVER AND ZINC BASED LAYERED DOUBLE HYDROXIDES FOR POLLUTANT REMOVAL UNDER SIMULATED SOLAR LIGHT

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Abstract

Nitrophenols are among the most hazardous refractory pollutants showing high stability and solubility in water. This work presents heterostructures of nanoparticles of silver/zinc based layered double hydroxides as efficient photocatalysts for degrading 4-nitrophenol (4-NPh), from aqueous solutions under irradiation with solar light. ZnAl-layered double hydroxides (ZnAl-LDHs) with Zn/Al = 2:1 and Zn/Al = 3:1 ratios were synthesized, characterized by XRD, FTIR, SEM and TEM and further used as precursors to form mixed oxides after calcination at 550°C. Based on the capability of the calcined LDHs to reconstruct their layered structure in aqueous media, AgNO₃ solutions were used to obtain Ag nanoparticles directly on ZnAl-LDHs matrices. The calculated value of the band gap of Ag/ZnAl-LDHs was ~ 3.1 eV, revealing that these materials might successfully act as photocatalysts under solar light irradiation. The photocatalytic tests performed on the decomposition of 4-NPh aqueous solutions indicate that on Ag/ZnAl-LDH (3:1) 87% of 4-NPh was degraded after 6 h under irradiation with solar light.

Key words: solar photocatalysis, layered double hydroxides, silver nanoparticles, 4-nitrophenol

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