Photocatalytic removal of methyl orange using Ag/Zn–TiO₂ nanoparticles prepared by different methods

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ABSTRACT

Ag/Zn–TiO₂ nanoparticles were synthesized via two different methods: sol–gel method in the presence of ethanol under refluxing temperature and sol–gel low-temperature route in the presence of acetic acid under 0°C. The prepared samples were characterized by X-ray diffraction, transmission electron microscopy, energy-dispersive X-ray spectroscopy, N₂ adsorption–desorption isotherm, and Brunauer–Emmett–Teller analysis methods. The effects of preparation method on the crystalline structure, crystal size, and surface area of prepared Ag/Zn–TiO₂ nanoparticles were studied. Photocatalytic activity of synthesized nanoparticles was tested by photocatalytic removal of methyl orange (MO) under UV light radiation. The effects of preparation method, initial dye concentration, and recyclability of photocatalysts were studied. Ag/Zn–TiO₂ nanoparticles prepared via sol–gel method showed high photocatalytic activity during degradation of MO under UV light radiation due to increase in the specific surface area, total pore volume, and decrease in the crystallite size.

Keywords: Ag/Zn–TiO₂ nanoparticle; Sol–gel low-temperature; Preparation method; Photocatalytic activity