

Efficient Photodegradation of Methyl Red Dye by Kaolin Clay Supported Zinc Oxide Nanoparticles with Their Antibacterial and Antioxidant Activities

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Abstract : Kaolin clay (KC) supported Zinc oxide (ZnO/KC) and ZnO nanoparticles (NPs) were prepared by a chemical reduction process and used for the photodegradation of methyl red (MR) as photocatalysts. Due to the interlayered porous structure of KC, we achieved a perfect association between ZnO NPs and KC. SEM image showed the irregular morphology of ZnO NPs, while ZnO/KC NCs were predominately round-shaped. Moreover, in both cases, NPs were present in dispersed and agglomerated forms with an average particle size way below 100 nm. The results acquired from photodegradation analyses showed that ZnO NPs and ZnO/KC NCs degraded about 82% and 99% of MR under UV light in a short irradiation time within 10 min. The recovered and re-recovered ZnO NPs and ZnO/KC NCs were also considerably photodegraded MR in an aqueous medium. The same NPs also exhibit promising bioactivities against two pathogenic bacteria, i.e., Citrobacter and Providencia. ZnO/KC NCs' antioxidant activity reached a reasonable 70% compared to the 88% activity of the standard ascorbic acid.

Keywords : nanoparticles, photocatalyst, photodegradation, zinc oxide, methyl red

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