

Eco-friendly photocatalysts for degradation of dyes

ABSTRACT

In the current era of globalization, synthetic dyes are one of the key factors of water pollution. Photocatalysis constitutes a promising technology for the treatment of wastewater, especially to those containing hard-to-remove organic compounds. Zinc oxide nanoparticles (ZnONPs) play a vital role as a photocatalyst material. This research highlights the synthesized ZnONPs with roselle flower and oil palm leaf extract. The extracts and sodium hydroxide (NaOH) act as reducing agents during the synthesis process. Synthesis without the addition of plant extract is used as blank control for the experiment. Structural and optical studies of the three variants of ZnONPs were performed. High purity of ZnONPs with element Zn and O was obtained. The size of the three variants of ZnONPs was from 10–15 nm and found in agglomerated spherical shape. Large band gap, 3.2 eV was obtained by UV-Vis and high thermal stability was proven by TGA. Oxygen vacancies that assist in the degradation phenomenon were found in ZnONPs. Five percent of ZnONPs with the presence of 10 W UV light could effectively degrade 10 ppm MO in 5 h and MB in 3 h. Besides, high antioxidant properties and low toxicity demonstrated the ability of ZnONPs to be used as photocatalysts. In conclusion, ZnONPs can be further developed for pharmaceutical and industrial use.

Keyword: Green synthesis; Zinc oxide; Photocatalytic