Enhancing Photocatalytics Activity of the ZnO Nanoparticles using Nanocomposites for Removal of Organic Pollutants

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Persistent Organic Pollutants (POPs) are an increasingly relevant issue in industrialized countries that pose a risk to health and the environment. This project was designed to enhance the photocatalytic activity of ZnO nanoparticles for the remediation of polluted aquatic environment from organic dyes. The experimentation was conducted in two stages; First, ZnO nanoparticles (ZnONPs) were synthesized by facile method using ZnSO4 and NaOH. To optimize the efficiency of dye removal, the ZnONPs were annealed in different temperature and times. Second, 4mg of optimized ZnONPs were supported on 16mg of nanoclay Halosite (H), graphene (G), and multi-walled carbon nanotubes (MWCNTs). This allowed for the formation of nanocomposites. The ZnONPs were characterized in order to understand their chemical, physical, and morphological structures. The TEM showed that ZnONPs had an average diameter of 30 nm and XRD showed the formation of ZnO having hexagonal wrutzite crystal. To study the removal efficiency, 4mg of ZnONPs, calcinated at 200°C for two hours were able to remove 13.1% of orange G. The ZnO nanocomposites removal efficiency showed the total amount enhanced of ZnO/H 34.0%, ZnONPs/MWTCNs 35.8% and ZnONPs/G 70.0%. The photocatalytic activity of the ZnO nanocomposites showed ZnONPs 1% ,ZnONPs/H 0%, ZnONPs/MWCNTs 33%, and ZnONPs/G 69%. This research work showed that supporting ZnONPs greatly enhanced their photocalaytic activity, which significantly contributed to the remediation of the aquatic environment from the organic dyes pollution. This method will be applied to the removal of different organic dyes from real polluted water samples collected from different locations.

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