Synthesis of ZnO/rGO nanohybrid for improved photocatalytic activity

ABSTRACT

Nanohybrids of zinc oxide/reduced graphene oxide (ZnO/rGO) with varying graphene oxide content were prepared via precipitation and were subsequently utilised in the photodegradation of methyl orange (MO) under UV light irradiation. The prepared photocatalysts were characterized by X-ray Diffraction (XRD), Field Emission Scanning Electron Microscopy (FESEM), Transmission Electron Microscopy (TEM) and Raman spectroscopy. The surface area and the band gap energy of the photocatalysts were determined by the Brunauer-Emmett-Teller method and UV-visible spectroscopic analysis. The ZnO/rGO nanohybrids produced had smaller particle sizes and lower band gap energy than that of ZnO. All the ZnO/rGO nanohybrids demonstrated better photocatalytic efficiency in the photodegradation of MO compared to ZnO. ZnO/rGO10 exhibited the highest photocatalytic activity with a rate constant that was four times higher than pure ZnO and about 40% enhancement in the photocatalytic activity for the removal of methyl orange within 3 hours. The enhanced photocatalytic performance of the ZnO/rGO photocatalysts was due to the efficient transfer of photogenerated electrons to the graphene sheet that inhibited the recombination of electron-hole pairs.

Keyword: Zinc oxide; Reduced graphene oxide; Nanohybrid, precipitation method; Photocatalysis