

Abstract

This study focuses on utilization of biomass waste for fabrication of multilayered graphene (MLG) via cellulose extraction. MLG nanosheets were synthesized from corn husk via alkali-acid treatments, pyrolysis, and activation. Initially, cellulose was extracted followed by carbonization and activation of the carbon material. Multilayered graphene/zinc oxide (MLG/ZnO) nanocomposite was synthesized through *ex-situ* casting of ZnO and MLG nanopowders. The photocatalytic degradation of congo red (CR) and rhodamine B (RhB) by MLG/ZnO photocatalyst under sunlight irradiation exhibited maximum degradations of 100 and 86%, respectively, while pristine ZnO gave degradations of 85 and 71% for RhB and CR, respectively. The obtained results validated high photocatalytic activity for the optimized MLG/ZnO nanocomposite in RhB and CR degradation under natural sunlight irradiation. The nanocomposite further demonstrates 95% degradation for doxycycline (DOX) under UV light. This work provides an insight into better ways of recycling biomass waste to fabricate valuable materials to solve environmental problems.