Abstract

The present study synthesized carbon sphere (CS) and polyvinylpyrrolidone (PVP) doped MnO_2 nanorods via co-precipitation technique. Using a systematic approach, this research investigates the deliberate doping of carbon spheres at 2 and 4 wt.% concentrations into a predetermined quantity of PVP-doped MnO_2 nanorods (NRs). The motive of this work was to reduce the recombination rate and inhibit the dimension of NRs that caused to increase in the catalytic reduction of methylene blue. Several characterization techniques were utilized to check the effect of doping agents (CS and PVP) on the structural, morphological and optical characteristics of MnO_2. The XRD pattern evidenced that MnO_2 had an orthorhombic framework, and incorporating PVP and CS reduced the crystallinity of NRs. The electronic spectra revealed the blue shift, assigned to increase band gap energy by the addition PVP and CS. TEM analysis confirmed the formation of a network of MnO_2 nanorods and decreased size with the integration of dopants. CS and PVP-doped MnO_2 NRs significantly improved their microbicidal effectiveness towards *Escherichia coli* (*E. coli*) measured in an inhibitory zone mm and catalytic performance.