ABSTRACT

The presence of organic pollutants in environment dramatically increased the complexity of processing. The degradation of pollutants by using nanomaterials has recently becomes an efficient approach. In this study, a convenient one-step co-precipitation process was used to synthesize pristine magnesium oxide (MgO) and silver/polyacrylic acid (Ag/PAA) doped MgO nanoparticles (NPs). Four samples were prepared using fixed concentration of MgO and PAA while various concentrations of Ag (0.03 and 0.06) wt.% with fixed amount of PAA (0.06%). These samples were named as MgO, PAA-MgO, 3%Ag: PAA-MgO and 6%Ag: PAA-MgO (0:0-1, 0:0.06-1, 0.03:0.06-1, and 0.06:0.06-1). The structural, morphological and optical properties of synthesized products were examined using advanced techniques. X-ray diffraction (XRD) measurements confirmed hexagonal and cubic phases of MgO and crystallization decreased upon doping. Energy dispersive x-ray spectroscopy (EDX) study identified the presence of elements like Mg, O, Ag, Cl, and Na in synthesized product. UV-vis spectrophotometer identified a red shift upon doping in absorption spectra and influence of Ag: PAA on bandgap. Transmitting electron microscopy (TEM) micrographs revealed hexagonal NPs morphology of MgO and highly agglomerated non uniformly distributed polymer network with NPs upon PAA and Ag incorporation. These synthesized samples were used to monitor methylene blue (MB) dye decolorization from an aqueous medium as well as growth inhibition of *Staphylococcus aureus (S. aureus)* and *Escherichia coli (E. coli)*. A significant improvement in photocatalytic and antibacterial performances was observed for doped NPs with an optimum degradation efficiency (93%) and efficient antibacterial activity towards *S. aureus* indicated by inhibition zone (mm) achieved for Ag: PAA-MgO.