## Abstract

The presence of toxic dyes in industrial waste dramatically diminishes the beneficial effects of remediation efforts. To overcome the hazardous impacts of dyes on biodiversity and environment, we integrated nanoparticles into polymers to substantially enhance their functionality and performance. 2 and 4 wt.% of chitosan (CS) and 3 wt.% of polyacrylic acid (PAA) doped cadmium selenide (CdSe) nanostructures (NSs) were prepared by co-precipitation approach. CdSe quantum dots (QDs) exhibit a narrow band gap energy, high solubility, and tunable properties, which are appropriate for redox reactions but show less adsorption and catalytic behavior. In this work, catalytic and antibacterial activities of CdSe QDs enhanced upon the integration of PAA due to increment in surface area. Furthermore, the addition of CS escalates the dye degradation and microbes evolve to the interaction of CdSe surface with the functional groups of CS. Highly doped CdSe shows significant inhibitory zones (7.70 to 9.30 mm) against Gram-positive bacteria *Staphylococcus aureus* (*S. aureus*).