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Improvement of Photocatalytic Activity by Zn Doping in Cu_2O

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Degradation of organic pollutants got more attention for detoxification of water. In this paper, pure and Zn-doped Cu_2O particles were successfully synthesized by water bath co-precipitation method. *X*-ray diffraction (XRD) study confirmed the cubic structure of Cu_2O. Zn doping resulted in reduction in crystallite size without changing *d*-spacing and crystal structure. Zn doping converts perfect cube to distorted sphere with enhanced surface area that is effective for photocatalytic applications. Elemental study confirmed the uniform distribution of Cu, Zn, and O atoms in the sample. *X*-ray photoelectron spectra (XPS) analysis showed peak shift in the electronic states of O with higher oxygen vacancy defects. Band gap of Cu_2O after Zn doping increased from 1.84 eV to 1.91 eV. The photocatalytic activity towards methylene blue (MB) dye photo- degradation under visible light reached 96% in 120 min after Zn doping compared to 95% in 180 min for pure Cu_2O. The improvement in photocatalytic degradation after Zn doping was achieved by the slow electron–hole recombination, band gap increases, oxygen vacancy defects, and higher surface area.

Keywords: photocatalytic activity, Cu_2O, Zn doping, methylene blue, oxygen vacancy defects.