# Effects of dopant type and concentration in boosting ZnO-based photocatalytic removal of gaseous toluene under solar-simulated light

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In this study, the effects of different metal dopants and their concentration on photocatalytic performance of ZnO nanoparticles were investigated for toluene degradation in gas phase. Three transition metals were selected as dopants for ZnO nanoparticle, and these catalysts were synthesized via facile one-step sol gel method. As for the removal characteristics, Cu-doped ZnO demonstrated enhanced performance compared to other dopants and removed 29% of gaseous toluene (570 ppm (v/v)) within 4 h. The enhanced performance can be attributed to the high dispersion of Cu on the ZnO surface as observed by SEM-EDS, allowing faster removal of toluene. Moreover, light absorbance in visible region was also increased for Cu-doped ZnO, resulting in higher visible light energy harvesting. Increasing the dopant concentration up to a certain amount also improved the toluene degradation under the same conditions, whereas too excessive increase of Cu amount did not result in considerable improvement in toluene removal. This enhancement in toluene removal can be attributed to the further improvement of its optical properties as well as high dispersion of Cu over ZnO nanoparticles.