Facile synthesis of boron nitride quantum dots decorated ZnO nanoparticle photocatalyst for the degradation of methylene blue and methyl orange

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In this study, a novel UV-light-driven boron nitride quantums dots doped ZnO nanoparticle composites (ZnO-BN) was successfully synthesized by facile solvent evaporation method. The photocatalytic activity of the ZnO-BN was remarkably higher than that of ZnO toward the degradation of methylene blue (MB) and methyl orange (MO) under UV light irradiation. With increasing BNQDs loading volumes, the photocatalytic activity of ZnO-BN initially increased, and then decreased. The reaction rate constant of the optimum active ZnO-4BN for the photodegradation of MB and MO were about 2.76-fold and 2.91-fold higher than that of bare ZnO, respectively. The efficiently enhanced photoactivity was attributed to the BNQDs not only can improve the photogenerated electron-hole pair's separation, but also can narrow the bandgap of ZnO-BN composites. Moreover, the as-prepared ZnO-4BN sample also exhibited excellent photostablity and recyclability for both photodegradation of MB and MO. In addition, the possible enhanced photocatalytic mechanism was proposed and analyzed by the active species trapping experiments.