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Meng Wang, Jianhao Hua, Yaling Yang

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Fabrication of CDs/CdS-TiO₂ ternary nano-composites for photocatalytic degradation of benzene and toluene under visible light irradiation

Meng Wang^{a,&}, Jianhao Hua^{a,&}, Yaling Yang^{a,*}

^a Faculty of Life Science and Technology, Kunming University of Science and Technology, Yunnan Province 650500, China.

[&] These authors contributed equally to this work and should be considered co-first authors.

*Corresponding author. E-mail address: yilyil8@163.com (Y. Yang).

Abstract: An efficient cadmium sulfide quantum-dots (CdS QDs) and carbon dots (CDs) modified TiO₂ photocatalyst (CdS/CDs-TiO₂) was successfully fabricated. The as-prepared ternary nano-composites simultaneously improved the photo-corrosion of CdS and amplified its photocatalytic activity. The introduction of CdS QDs and CDs could enhance more absorbance of light, prevent the undesirable electron/hole recombination, and promote charge separation, which was important for the continuous formation of •OH and •O₂⁻ radicals. When the optimal mass ratio of CdS QDs to CDs was 3:1, above 90% degradation efficiencies were achieved for benzene within 1 h and toluene in 2 h, while that of pure TiO₂ (P25), CdS QDs-TiO₂, CDs-TiO₂ nano-composites was around 15%. Owing to the symmetric structure and conjugation of methyl with benzene ring, the degradation of toluene was more difficult than benzene to carry on. The new fabricated nano-composites showed good

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