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Structure of Z-scheme CdS/CQDs/BiOCl heterojunction with enhanced photocatalytic activity for environmental pollutant elimination

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Abstract

Z-scheme CdS/CQDs/BiOCl heterojunction was synthesized by a facile region-selective deposition process. Owing to the electronegativity of the groups on the surface of **Carbon Quantum Dots (CQDs)**, CQDs can be sandwiched between CdS and BiOCl, based on the stepwise region-selective deposition process. The samples were systematically characterized by **X-Ray diffraction (XRD)**, **scanning electron microscopy (SEM)**, **transmission electron microscopy (TEM)**, **high resolution TEM (HRTEM)**, **X-ray photoelectron spectroscopy (XPS)**, **UV-vis diffuse reflectance spectroscopy (UV-vis DRS)**, **photoelectrochemical measurements and Photoluminescence (PL)**. The results indicate that CQDs with size of 2-5 nm and CdS **nanoparticles** with size of 5-10 nm dispersed uniformly on the surface of cuboid BiOCl nanosheets. The photocatalytic performance tests reveal that the CdS/CQDs/BiOCl heterojunction exhibits much higher photocatalytic activity than that of BiOCl, CdS/BiOCl and CQDs/BiOCl for Rhodamine B (**RhB**) and phenol photodegradation under visible and UV light illumination, respectively. The enhanced photocatalytic performance should be attributed to the Z-scheme structure of CdS/CQDs/BiOCl, which not only improves visible light absorption and the migration efficiency of the photogenerated electron-holes but also keeps high redox

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