Supporting Information

Self-assemble of CdS Quantum Dots with Polyoxometalates Encapsulated gold nanoparticles: Enhanced Photocatalytic Activities

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Supplementary Results

1. XRD, HRTEM measurements for CdS QDs

The amine-modified CdS QDs were prepared by water phase method. These CdS nanoparticles can be easily dissolved in water in the form of a stable colloidal suspension. The crystal structure of CdS QDs was examined with powder X-ray diffraction (PXRD). In Fig. S1a, the CdS QDs show very broad XRD peaks at $2\theta=20-60^{\circ}$, which reflects the small particle size. These peaks also prove that they belong to the zinc blend structures. The particle morphology and size of the CdS QDs were examined by High-resolution transmission electron microscopy (HRTEM), as shown in the Fig. S1b. High-resolution images revealed that most of the prepared CdS QDs have (111) lattice planes and monodisperse spherical morphology with a particle size of 2-3nm.



Fig. S1 (a) XRD pattern of the as-prepared CdS QDs; (b) HRTEM image of CdS QDs.

2. TEM and EDX measurements for Au NPs@POM



Fig. S2 (a) and (b) TEM of Au NPs@POM; (c) EDX analysis of the Au NPs@POM.

3. Surface Element Analysis Table of the CdS QDs/Au NPs@POM (corresponding to the Figure 1.c EDX

analysis)

Element	Weight/EDX	Atomic/EDX
S K	0.06146	0.300884
Cd K	0.181416	0.247788
WL	0.502212	0.424779
Au L	0.254912	0.026549

Fig. S3 Surface Element Analysis of the nanohybrids

4. UV Spectrum and Photo Luminescence spectra of the CdS QDs, CdS QDS/Au NPs and the CdS

QDs/POM



Fig. S4 UV/Vis spectroscopy (a) and Photo Luminescence spectra (b) for a: CdS QDs, b: CdS QDs/POM, c: CdS QDs/Au NPs-3%, d: CdS QDs/Au NPs@POM-3%

5. Degradation of Methyl Orange

In order to further test the photocatalytic activity and study the electron transfer of the nanohybrids, we also used the methyl orange as the degradation object. As shown in Figure S3 (a) and (d), we can see that the CdS QDs/Au NPs-0.6% @PW12 tri-component nanohybrids performed much faster degradation rate than the CdS QDs. To compare (b) with (d), we found that PW12 play an important role in the photocatalytic reaction. Similarly, from the comparison between (c) and (d), it was clearly that the addition of Au NPs enhanced the photocatalytic activity.



Fig. S5 Temporal course of the photodegradation of methyl orange 20mg/l inaqueous dispersions of different catalytic materials under visible light irradiation (a) CdS QDs; (b) CdS QDs/Au NPs-0.6%; (c) CdS QDs/PW12; (d) CdS QDs/Au NPs-0.6% @PW12.