Cr(VI) ions effective abatement on carbon dots-silica hybrids driven by visible light

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Supporting Materials

1. Fluorescence of carbon dots-silica hybrids

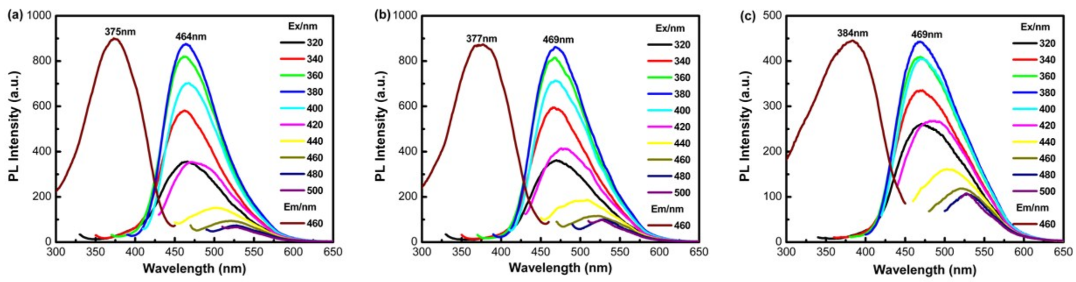

Fig. S1 Emission and excitation spectra of CDs-Si-H2 (a), CDs-Si-H3 (b) and CDs-Si-H4 (c) in aqueous solutions at different excitation wavelengths.

With the increase of carbon dots concentration in silica matrix, the optimal excitation and emission wavelength was red shift obviously.

2. FT-IR spectra of different samples of CDs-Si-H

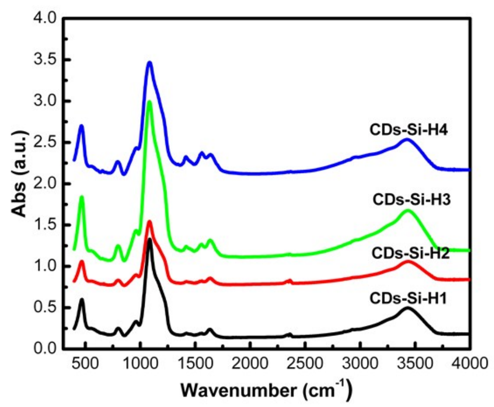

Fig. S2 FT-IR spectra of different CDs-Si-H samples

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3. XPS analysis of different CDs-Si-H samples

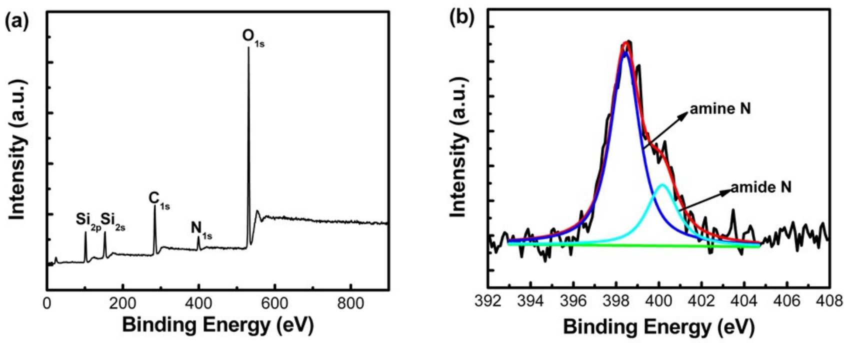

Fig. S3 XPS survey (a) and high-resolution N1s spectra (b) of CDs-Si-H4 with the identification of peaks by curve fitting

Table S1 Nitrogen surface concentration in different CDs-Si-H samples

samples	CDs-Si-H1	CDs-Si-H2	CDs-Si-H3	CDs-Si-H4
Nitrogen atomic concentration %	2.37	4.00	5.18	6.30

4. The investigation on the adsorption property of different CDs-Si-H samples to Cr(VI)

Two typical absorption bands centered at 351.5 and 257.5 nm with a small shoulder shorter than 500 nm appeared in the UV-Vis absorption spectrum of Cr(VI) aqueous solution (pH ~ 3). To evaluate the adsorption capacity of different photocatalysts to Cr(VI), the absorption changes at 350 nm of Cr(VI) after sonication and stirring were recorded (Fig. S4). In a typical procedure, a certain amount of Cr(VI) aqueous solution was first added into a photocatalyst dispersion. After sonication for 20min, adjusted the solution pH to 3 with 0.1 M HCl aqueous solution and the concentration of Cr(VI) and photocatalysts were respectively maintained at 8×10^{-4} mol/L and 1g/L. The solution was stirred in dark. 5 ml of the solution was taken in a certain interval of time, and then centrifuged and recorded the UV-Vis absorption of supernatants. The absorbance at 350nm was used to evaluate the residual Cr(VI) in the system and then the adsorptive ability of the photocatalysts to Cr(VI).

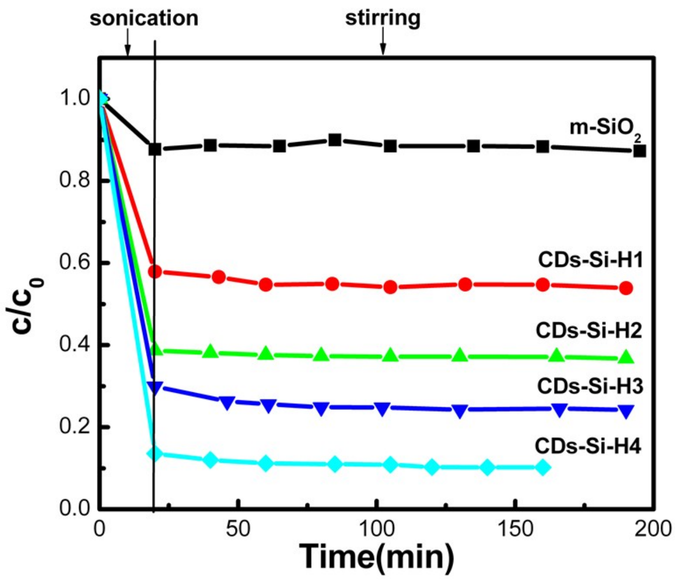

Fig. S4 relative concentration of Cr(VI) upon sonication and stirring time

in the presence of CDs-Si-H powders

5. Evaluation the fluorescent quenching of CDs-Si-H1 by Cr(VI)

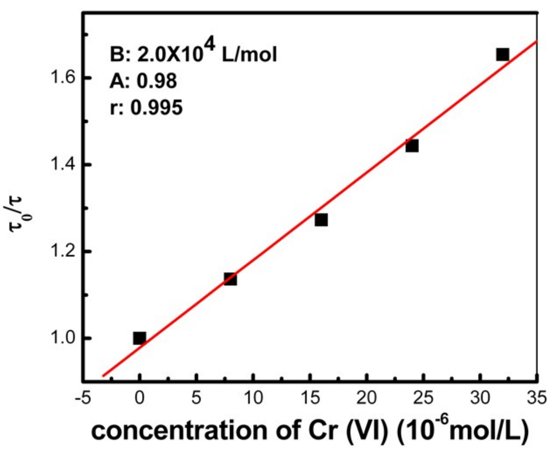

Fig. S5 Linear relationship between τ_{av0}/τ_{av} and the concentration of Cr(VI). τ_0 and τ is the original fluorescent lifetime and the lifetime in the presence of Cr(VI) of CDs-Si-H1.

With the increase of Cr(VI) concentration, the average fluorescent lifetime (τ_{av}) reduced gradually and fluorescence intensity became weaker and weaker (Fig. 6 and Table 3). A linear relationship existed between τ_{av0}/τ_{av} and the concentration of Cr(VI) with K_{sv} of 2.0X10^4 L/mol, illustrating that the fluorescence quenching induced by Cr(VI) follows dynamic (collisional) quenching mechanism and the quenching constant was close related to diffusion velocity of Cr(VI) in reaction medium.

6. Color change of CDs-Si-H4 before and after the photocatalytic reaction

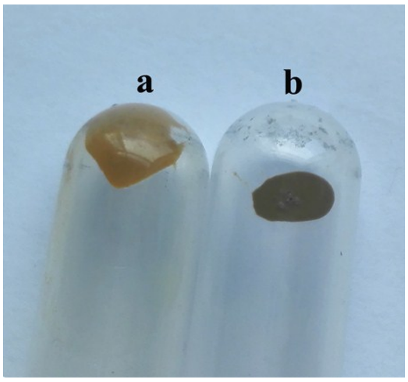

Fig.S6 Color change of CDs-Si-H4 before (a) and after (b) the photocatalytic reaction

7. Photocatalytic efficiency of CDs-Si-H4 upon recycled times

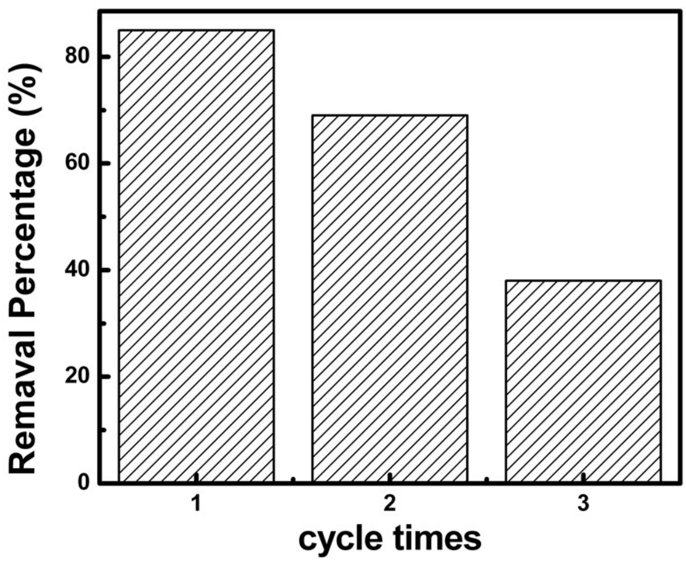

Fig. S7, Photo-reduction efficiency of Cr(VI) decreased with the recycle number.