Supporting Information

Simultaneously photocatalytic redox and removal of chromium(VI) and arsenic(III) by hydrothermal carbon-sphere@nano-Fe$_3$O$_4$

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Figure S1. SEM images of fresh HCS@Fe$_3$O$_4$
Figure S2. Elemental mapping images of fresh HCS@Fe₃O₄
Figure S3. SEM images of used HCS@Fe₃O₄
Figure S4. Elemental mapping images of used HCS@Fe$_3$O$_4$.
Figure S5. TGA profiles of HCS@Fe$_3$O$_4$ under nitrogen (a) and air (b).
Figure S6. Simultaneously redox efficiency of Cr(VI) (a) and As(III) (b) in different systems. [Cr(VI)]=100μM, [As(III)]=100μM, cat.=0.2g/L.
Figure S7. Distribution of Fe(III) species in solutions at different pH values.

Conditions: $[\text{Fe}^{3+}]_{\text{TOT}} = 50.00 \ \mu\text{M}$
Figure S8. ESR spectra in the HCS@Fe₃O₄ system in the dark at pH 3.0.
Figure S9. Distribution of Cr(III) species in solutions at different pH values.

Conditions: [Fe$^{3+}$]=200 μM, [Cr$^{3+}$]=100 μM, [e$^-$]=9.3 μM
Figure S10. Species distribution of FeAsO$_4$ solution at different pH.

[FeAsO$_4$]=0.1mol·kg$^{-1}$ H$_2$O
Figure S11. Cycling experiments of HCS@Fe$_3$O$_4$ for the removal percentage of Cr(VI) and As(III) under light irradiation. [Cr(VI)]=100µM, [As(III)]=100µM, HCS@Fe$_3$O$_4$=0.2g/L.
Figure S12. The release of Fe(II) in the HCS@Fe₃O₄ system and the change of Fe(II)

with the addition of Cr(VI) or As(III) after 120min.