

## Electronic Supplementary Information

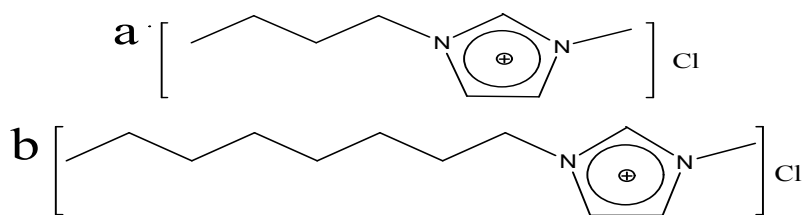
# Ionic Liquid-Assisted Solvothermal Synthesis of Three-Dimensional Hierarchical Copper Sulfide Microflowers at Low Temperature with Enhanced Photocatalytic Performance

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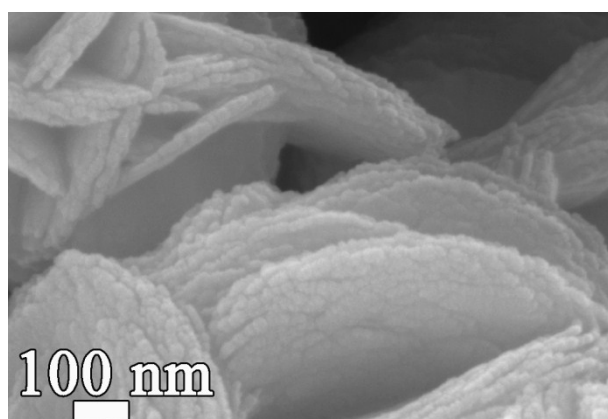
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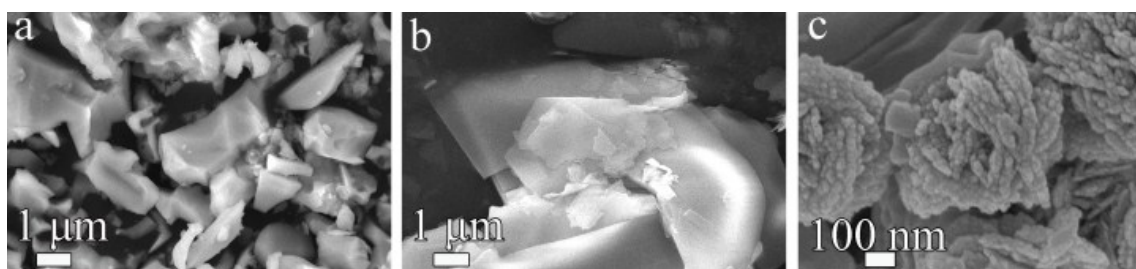
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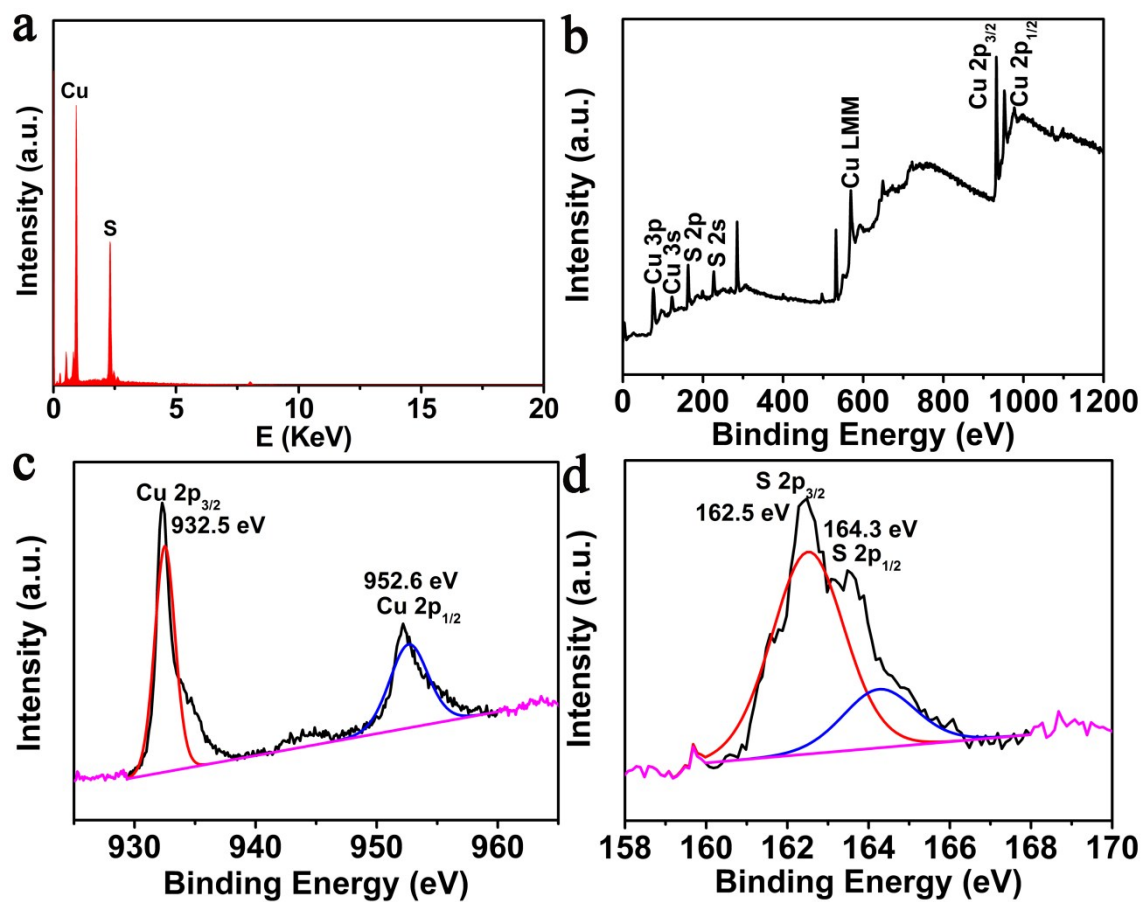
**Fig. S1** Structural view of (a) [BMIm]Cl and (b) [OMIm]Cl.



**Fig. S2** High-magnification FE-SEM image of 3D hierarchical CuS microflowers (S-4) obtained in [BMIm]Cl-MeOH mixed solvent with 4.58 M [BMIm]Cl at 65 °C for 20 min.



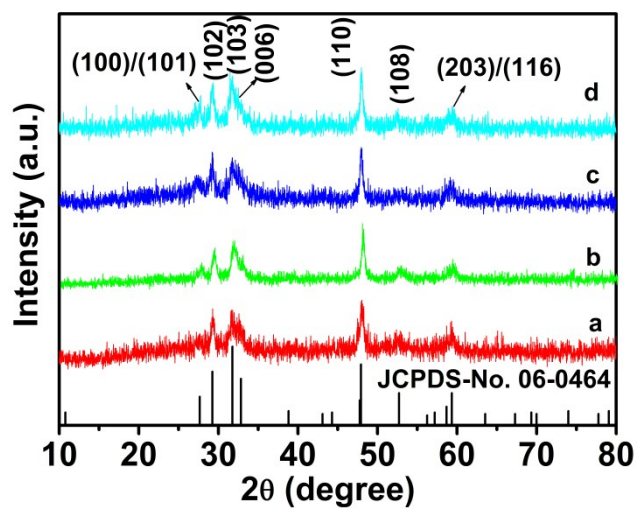
**Fig. S3** FE-SEM images of the samples obtained at different reaction durations in [BMIm]Cl-MeOH mixed solvent with 4.58 M [BMIm]Cl at 65 °C: (a) 1 min, (b) 3 min, and (c) 10 min.



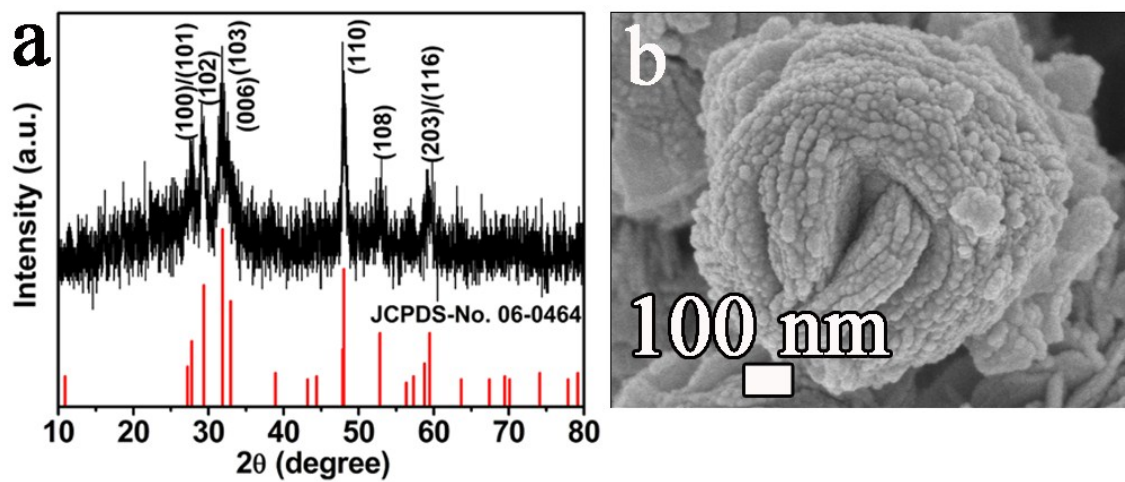
**Fig. S4** (a) EDS and (b-c) typical XPS spectra of the sample obtained in [BMIm]Cl-MeOH mixed solvent with 4.58 M [BMIm]Cl at 65 °C for 10 min: (b) survey spectra (c) Cu<sub>2p</sub> region, and (d) S<sub>2p</sub> region.

**Table S1** The atomic ratios of Cu and S elements from the EDS and XPS spectra.

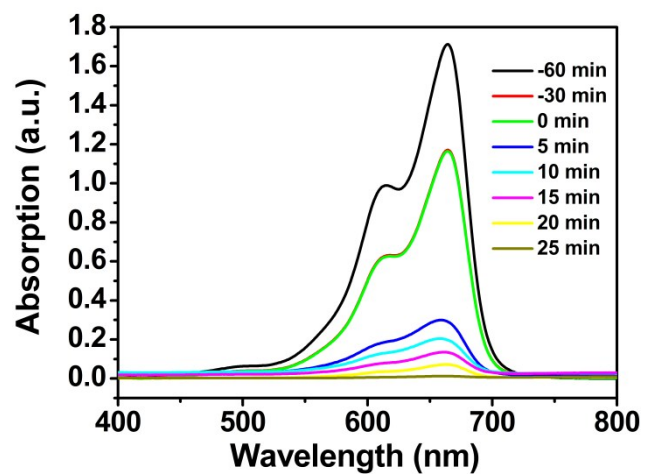
	EDS	XPS
Cu At%	49.05	48.98
S At%	50.95	51.02



**Fig. S5** XRD patterns of samples obtained in different molar concentration of [BMIm]Cl at 65 °C for 20 min: (a) S-0, (b) S-1, (c) S-2, and (d) S-3.

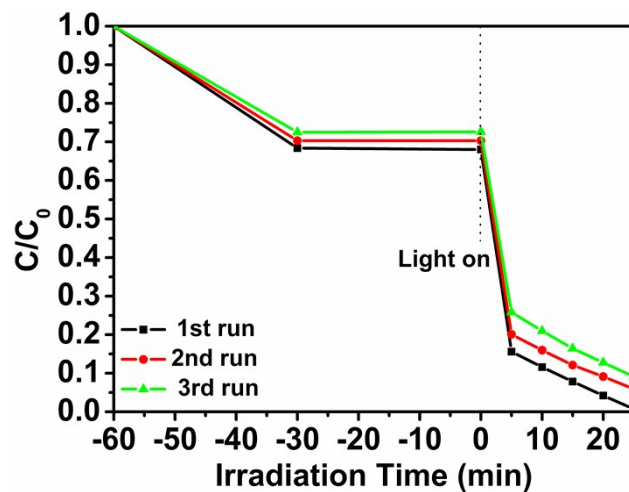


**Fig. S6** (a) XRD and (b) FE-SEM image of compact flower-like CuS superstructures obtained in [OMIm]Cl-MeOH mixed solvent with 4.58 M [OMIm]Cl at 65 °C for 20 min.



**Fig. S7** Time-dependent UV-Vis absorption spectra applying 3D hierarchical CuS microflowers (S-4) obtained in [BMIm]Cl-MeOH mixed solvent with 4.58 M [BMIm]Cl at 65 °C for 20 min as photocatalyst.





**Fig. S8** Visible-light irradiation photocatalytic degradation curves for MB (10 ppm) in the first three cycles applying 3D hierarchical CuS microflowers (S-4) obtained in [BMIm]Cl-MeOH mixed solvent with 4.58 M [BMIm]Cl at 65 °C for 20 min as photocatalyst.

**Table S2** Comparison of photocatalytic activity of different materials for degradation of MB.

materials	catalysts (mg)	MB concentration (ppm)	MB volume (mL)	time (min)	photodegradation degree ( $\xi$ , %)	reference
3D hierarchical CuS microflowers	20	10	100	25	99	this work
CuS hierarchical structures	30	20	40	90	87	S1
CuS plates	10	3	30	30	80	S2
CuS nanoparticles	20	0.16	50	90	94	S3
hollow CuS microspheres	20	11.3	106	48	74	S4
CuS microflowers	5	10	30	25	98	S5
CdS hollow nanospheres	50	14	50	60	87	S6
Fe <sub>2</sub> O <sub>3</sub> /ZnO hollow spheres	50	5	100	50	95.2	S7

**Table S3** The total organic carbon (TOC) results of MB.

Irradiation Time	TOC concentration (mg L <sup>-1</sup> )
Before degradation (-60 min)	8.2570
After degradation (25 min)	0.4885

### Supplementary references

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