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Hierarchical porous quaternary Cu-Fe-Sn-S hollow chain microspheres: Rapid microwave nonaqueous synthesis, growth mechanism, and their efficient removal of organic dye pollutant in water

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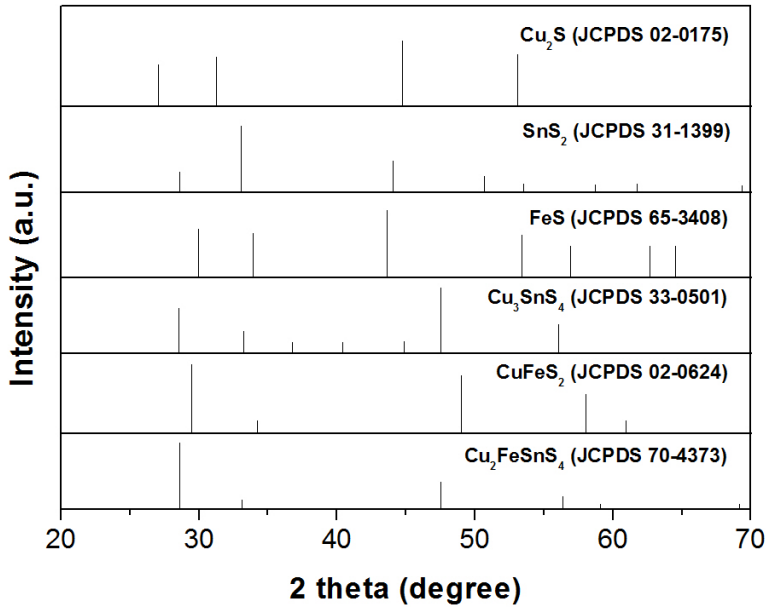

Fig. S1 Standard XRD patterns of binary and ternary sulfides

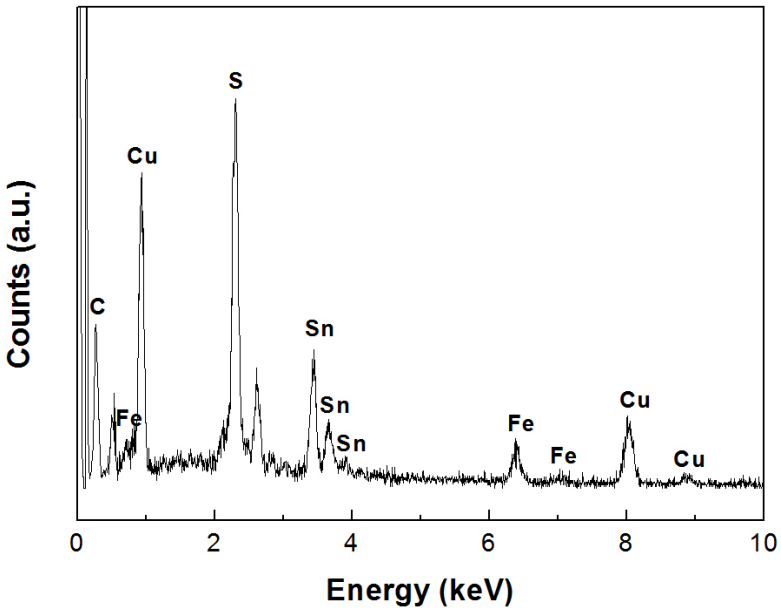

Fig. S2 EDS spectrum of the final product

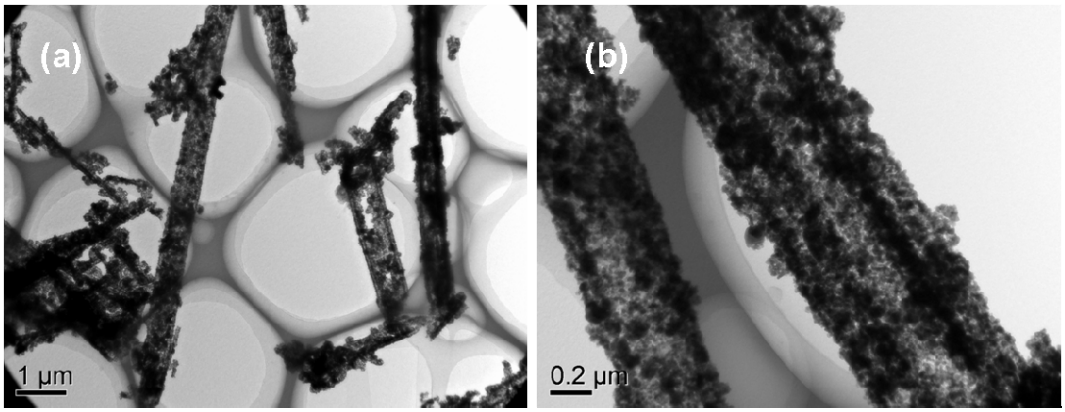

Fig. S3 TEM images of the CITS synthesized in the absence of ODA

To study the role of ODA on the formation of CITS HCMs, a parallel experiment was performed in the absence of ODA, which produced one-dimensional porous tubular structure (Fig. S3), rather than hollow chain microspheres. Therefore, it is reasonable to conclude that ODA molecules play a crucial role in forming hollow chain microsphere structures.

Table S1. Adsorption kinetic parameters for MO adsorption on the CITS HCMs

	Pseudo-first-order kinetics				Pseudo-second-order kinetics		
C_0 (mg L^{-1})	k_1 (min^{-1})	$q_{e,cal}$ (mg g^{-1})	$q_{e,exp}$ (mg g^{-1})	R^2	k_2 (g mg^{-1} min^{-1})	$q_{e,cal}$ (mg g^{-1})	R^2
20	0.3518	7.63	18.65	0.7512	0.2059	19.07	0.9999
30	0.3061	15.77	28.14	0.8468	0.0699	28.85	1
40	0.3162	18.91	37.28	0.8024	0.0649	38.11	1
60	0.2358	30.23	53.63	0.7605	0.0228	55.86	0.9999
80	0.2683	37.91	72.24	0.7727	0.0235	74.18	0.9999

Table S2. Adsorption isotherm parameters of the adsorption of MO on the CITS HCMs

Langmuir isotherm			Freundlich isotherm		
b (L mg^{-1})	q_m (mg g^{-1})	R^2	K_f	n	R^2
0.186	123.6	0.9136	20.57	1.537	0.9712

Table S3. Comparison of MO adsorption rates and capacities of different adsorbents

Adsorbent	Adsorption capacities (mg g^{-1})	References
CITS HCMs	123.6	This work
BiOBr hierarchical microspheres	15.3	S1
α-Fe_2O_3 porous nanorods	39.5	S2
chitosan/γ-Fe_2O_3/MWCNTs composite	66.1	S3
γ-Fe_2O_3 nanoparticles	0.1	S4
polyaniline microspheres	154.56	S5
MgO nanostructures	36.6	S6

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