Electronic Supplementary Material (ESI) for Green Chemistry.

Supplementary material

Fe-doped γ-Al_2O_3 porous hollow microspheres for enhanced oxidative desulfurization: Facile fabrication and reaction mechanism

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Table S1 Lattice parameters of samples different in iron content[a]

Sample	$2\theta_{(400)}$	d_{400}[b] (Å)	a_0[c] (Å)	Crystallite size[d] (nm) (Al_2O_3)	Crystallite size[d] (nm) (Fe_2O_3)
Al_2O_3	46.01	1.971	7.884	14.89	/
2Fe-Al	45.87	1.977	7.908	14.75	8.56
5Fe-Al	45.47	1.993	7.972	14.64	12.64
7Fe-Al	45.31	2.001	8.004	14.59	15.96
10Fe-Al	45.05	2.011	8.044	14.38	19.67

[a] d_{400} and a_0 were calculated on the basis of XRD data.

[b] d_{400} is interplane distance, $d_{400} = \lambda/(2\sin\theta)$, λ=1.5406 Å.

[c] a_0 is lattice parameter, $a_0=d_{(400)}*\sqrt{(h^2+l^2+k^2)}=4\ d_{(400)}$.

[d] $D= K\lambda/(\beta\cos\theta)$ (K=0.8929).

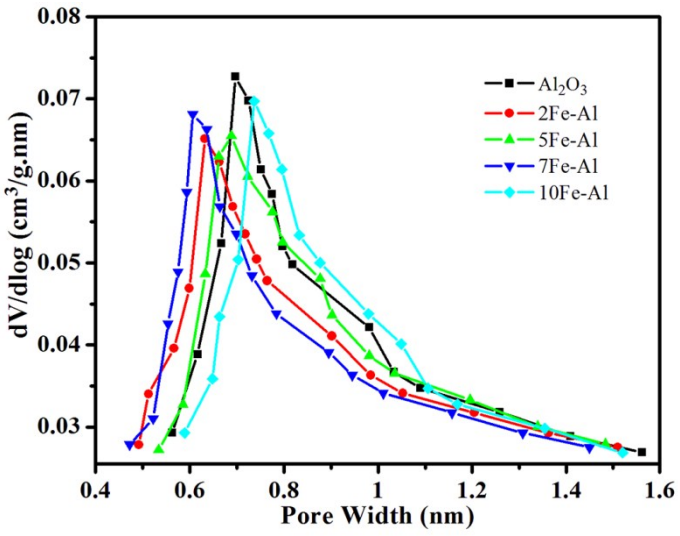

Fig. S1 Micropore pore size distributions of xFe-Al samples.

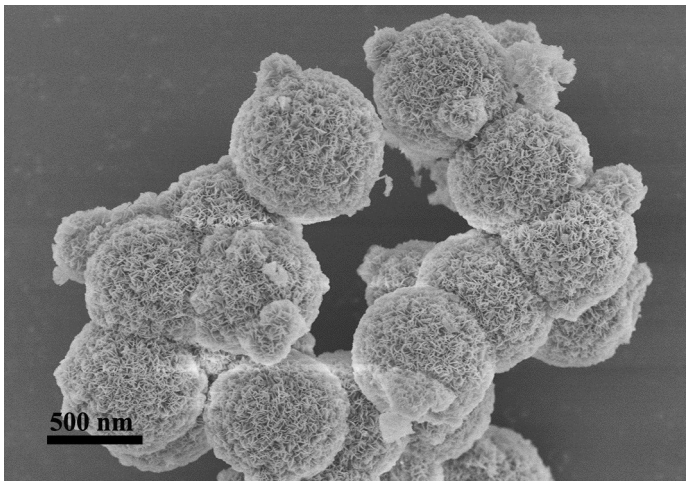

Fig. S2 SEM images of un-doped Al_2O_3 calcined at 550 °C.

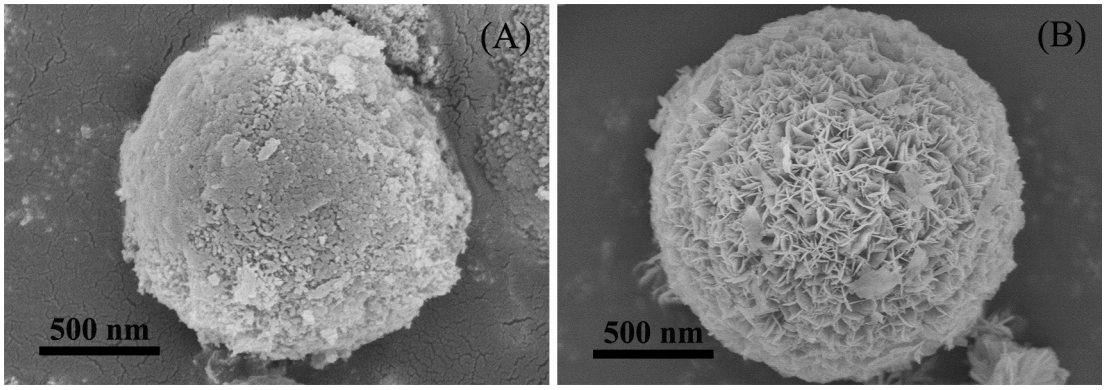

Fig. S3 SEM images of 7Fe-Al extracted at (A) 8 h and (B) 16 h during preparation.

Table S2 Performance of alumina-based catalysts in selective oxidation of H_2S

Feed	Catalyst	GHSV h^{-1}	Temp. °C	Conv. %	Sel. %	Yield %	Ref.
$H_2S/O_2/N_2$=0.5/0.25/99.25	Fe/Al_2O_3	12 000	190	100	100	100	This work
H_2S/O_2/ He =1/1.1/97.8	Fe/Al_2O_3	/	250	69	89	62	1
$H_2S/O_2/He^{(a)}$ =1/5/−	Fe/Al_2O_3	12 000	197	91	90	81.9	2
$H_2S/O_2/N_2$= 5/2.5/92.5	Al-Lap	7000	300	100	96	96	3
$H_2S/O_2/He^{(a)}$ =1/2.5/−	Fe/Al_2O_3	3000	250	97.7	88	86	4

[(a)] The reaction mixture contains 30% H_2O.

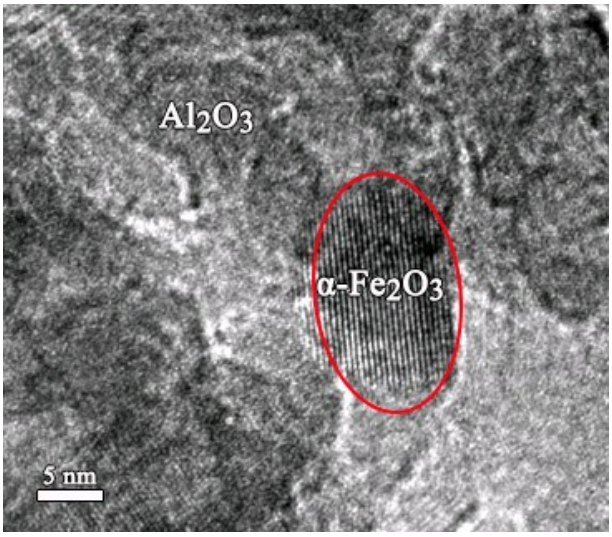

Fig. S4 HRTEM image of 7Fe-Al sample.

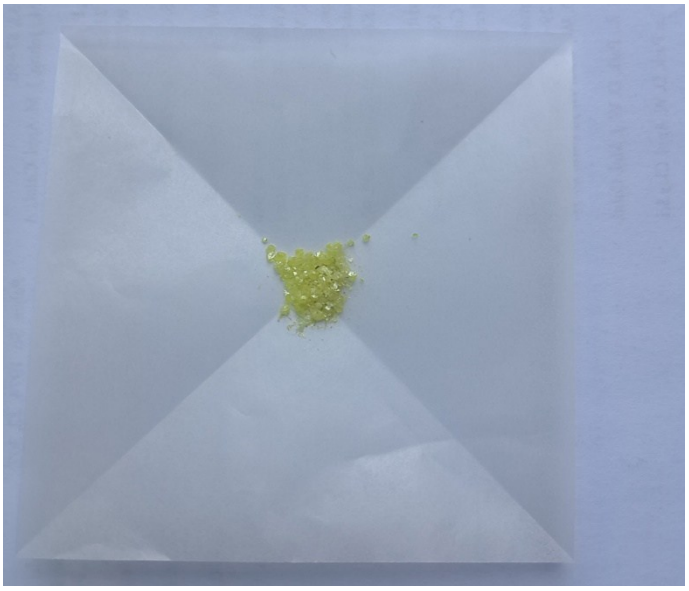

Fig. S5 Picture of sulfur recovered from the effluent.

Table S3 H_2 consumption over catalysts in H_2-TPR studies

Catalyst	Peak position (°C)	H_2 consumption (mmol/g)
Al_2O_3	/	/
2Fe-Al	485	5.98
5Fe-Al	514	7.26
7Fe-Al	536	12.4
10Fe-Al	557	15.8

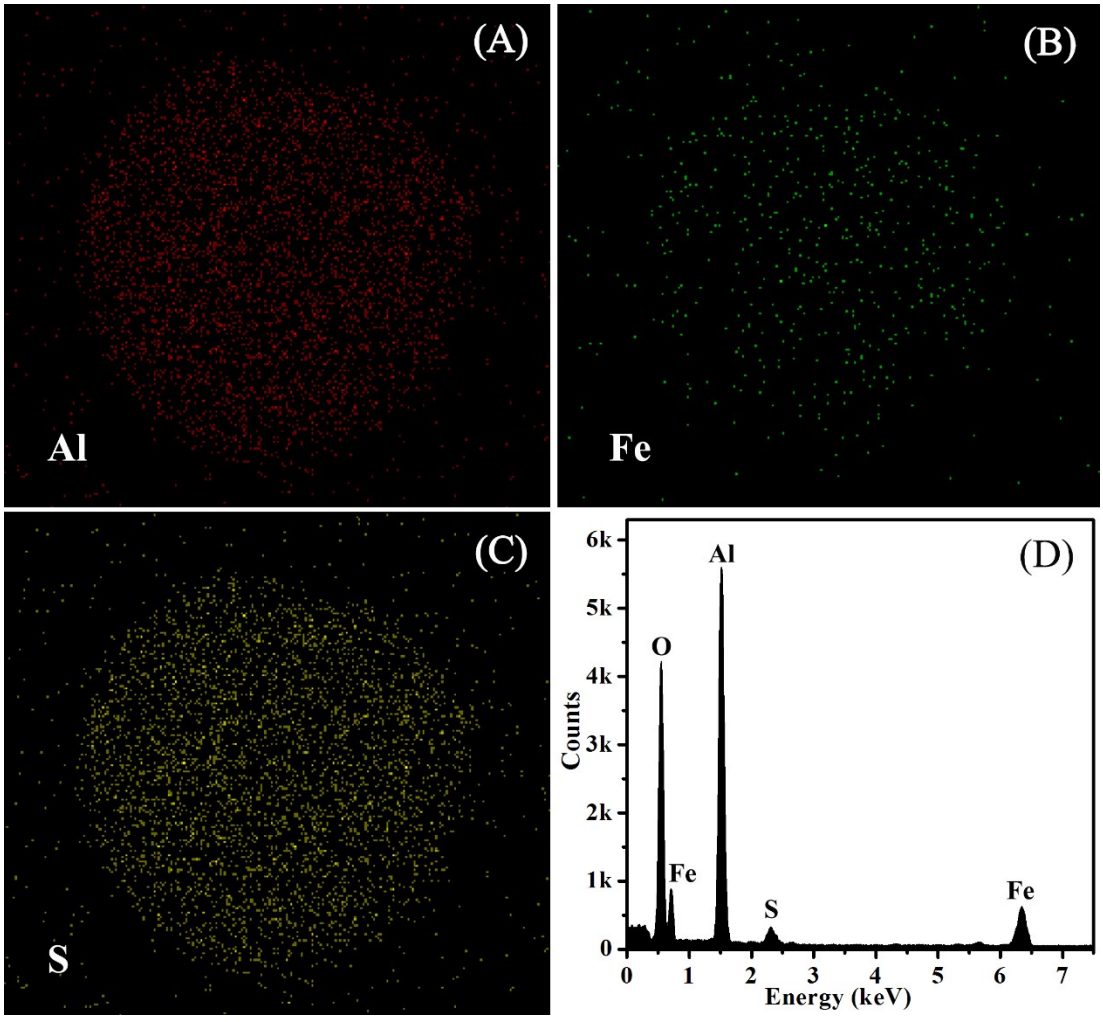

Fig. S6 SEM mappings and EDX spectrum of used 7Fe-Al.

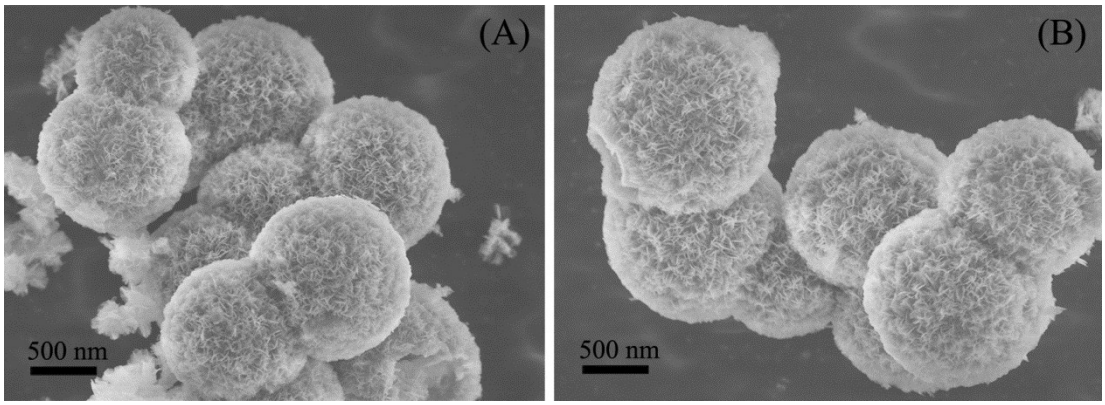

Fig. S7 SEM images of Al_2O_3 (A) and 7Fe-Al (B) after long-term reaction.

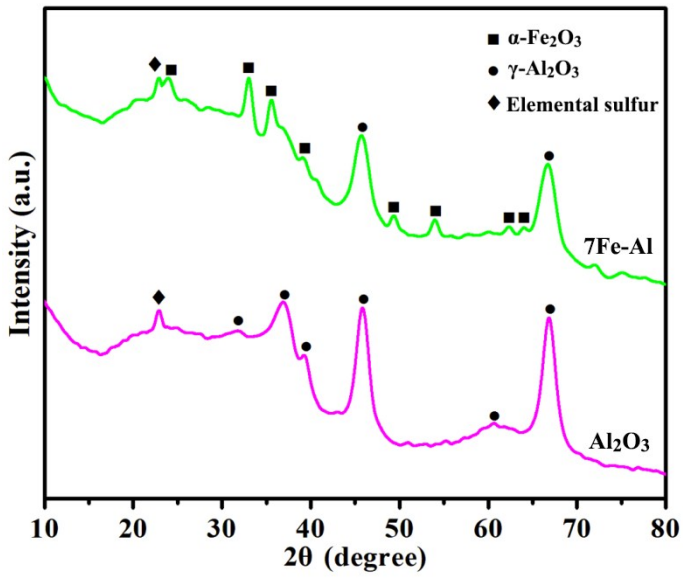

Fig. S8 XRD patterns of Al_2O_3 and 7Fe-Al after long-term reaction.

Table S4 Textural parameters of Al_2O_3 and 7Fe-Al after long-term reaction

Sample	SSA_{BET} (m^2/g)	Pore volume (cm^3/g)		Pore size (nm)	
		Micropore	Mesopore	Micropore	Mesopore
Al_2O_3	161.4	0.09	0.48	0.74	13.0
7Fe-Al	221.3	0.18	0.62	0.66	11.7

References

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