Supplementary Information for

A structured catalyst based on cobalt phtalocyanine/calcined Mg-Al hydrotalcite film for the oxidation of mercaptan

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Fig. S1 Photograph of the CoPcS/MMO structured catalyst.

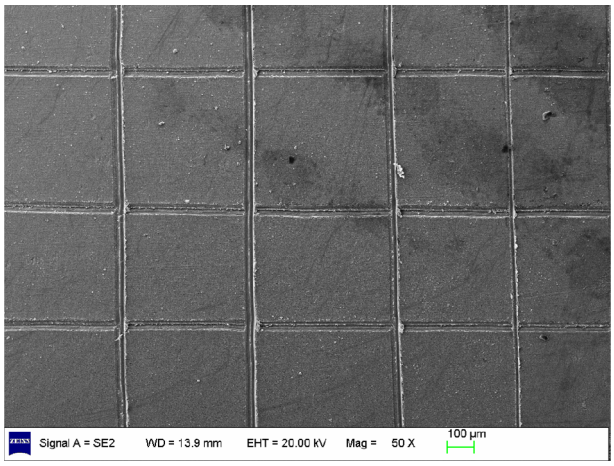

Fig. S2 SEM image of the CoPcS/MMO film tested for adhesion.

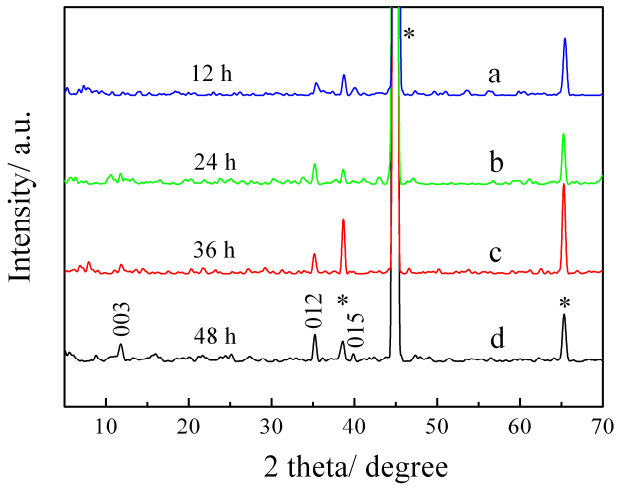

Fig. S3 XRD patterns of the LDH films on aluminum substrates with different growth time: (a) 12 h, (b) 24 h, (c) 36 h and (d) 48 h.

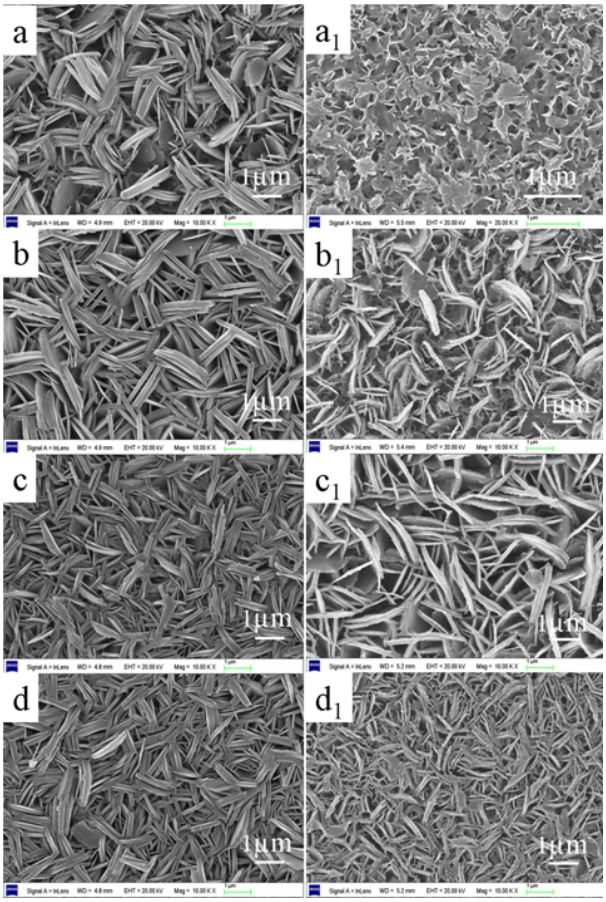

Fig. S4 SEM images for the LDH films on aluminum substrates (a-d) with different growth time (a: 12 h; b: 24 h; c: 36 h; d: 48 h) and the resulting MMO/aluminum films after calcination (a_1-d_1).

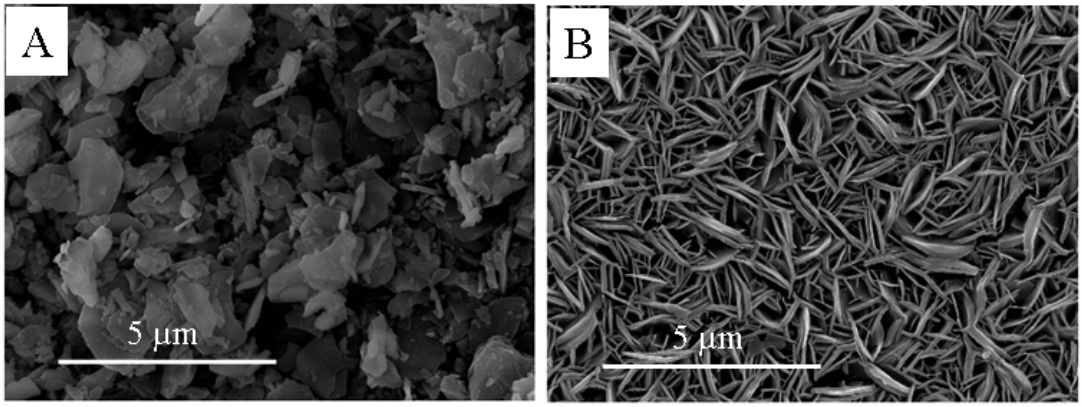

Fig. S5 SEM images for the CoPcS/MMO powder sample (A) and the CoPcS/MMO film sample (B).

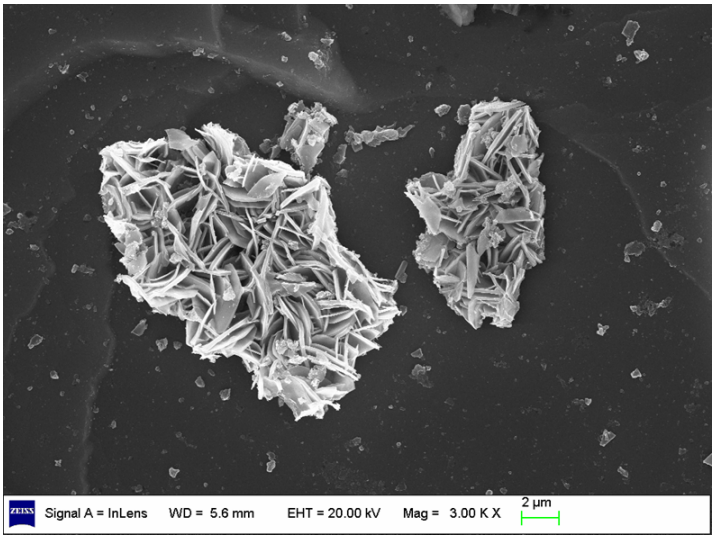

Fig. S6 SEM image of the CoPcS/MMO powder material scraped from the CoPcS/MMO film.

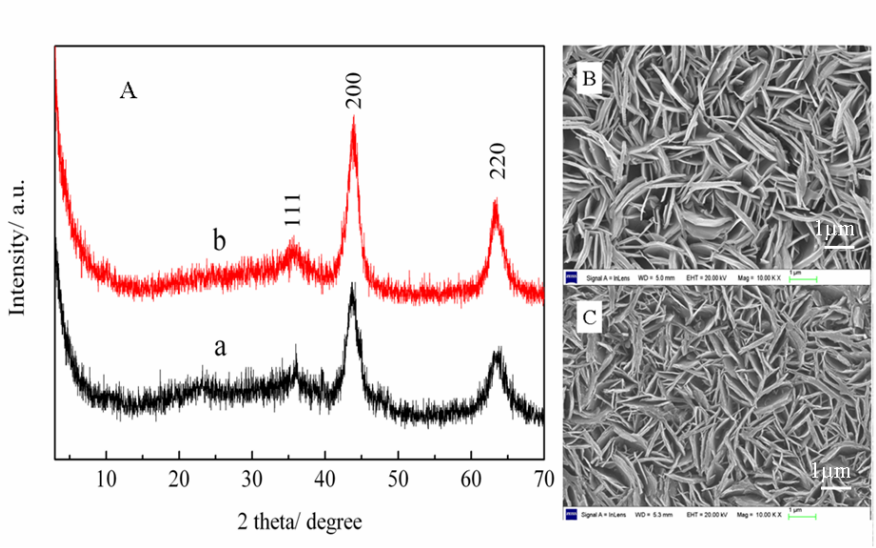

Fig. S7 (A) XRD patterns of the CoPcS/MMO structured catalyst before (a) and after (b) five reaction-regeneration cycles. SEM images of the CoPcS/MMO structured catalyst before (B) and after (C) five reaction-regeneration cycles.

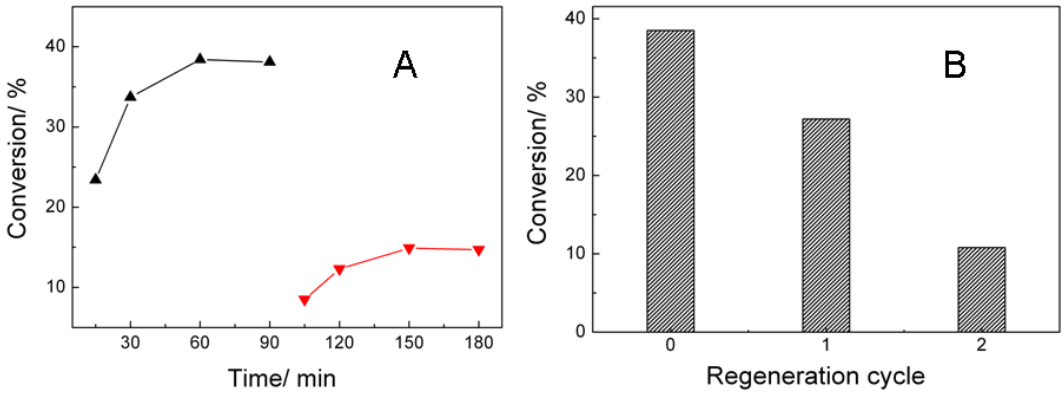

Fig. S8 (A) The catalytic capability of the CoPcS/MMO powder catalyst for the oxidation of mercaptan; (B) the conversion of mercaptan *vs* regeneration cycle.

Table S1 Chemical composition of the structured catalysts with different growth time and the corresponding conversion of mercaptan (area of the structured catalyst: 140 cm^2)

Film growth time (h)	Mg ($\times10^{-2}$ mg/cm^2)	Co ($\times10^{-4}$ mg/cm^2)	CoPcS ($\times10^{-3}$ mg/cm^2)	Conversion (%)
12	1.92	2.95	4.90	65.2
24	5.02	3.77	6.27	80.1
36	6.72	4.28	7.11	85.7
48	12.55	5.23	8.69	70.9

Table S2 Chemical composition of the structured catalysts with different loading of CoPcS and the corresponding conversion of mercaptan (area of the structured catalyst: 140 cm^2)

Concentration of CoPcS in methanol (ppm)	Mg ($\times10^{-2}$ mg/cm^2)	Co ($\times10^{-4}$ mg/cm^2)	CoPcS ($\times10^{-3}$ mg/cm^2)	Conversion (%)
10	6.72	3.23	5.37	68.4
20	6.72	3.41	5.67	79.6
30	6.72	4.28	7.11	85.7
40	6.72	5.79	9.62	82.9
50	6.72	6.57	10.9	66.7

Table S3 The basicity of the CoPcS/MMO powder and film catalyst respectively

Catalyst	Basic sites[a]	Percentage of each basic site (%)	Adsorbed CO_2 (mmol/g)
CoPcS/MMO-powder	w.b.s.	3.9	0.02
	m.b.s.	45.4	0.20
	h.b.s.	50.7	0.22
CoPcS/MMO-film	w.b.s.	0.0	0.00
	m.b.s.	100. 0	0.31
	s.b.s.	0.0	0.00

[a] w.b.s.: weak basic site; m.b.s.: moderate basic site; s.b.s.: strong basic site.