

Bifunctional Ordered Mesoporous Materials. Direct synthesis and study of the distribution of two distinct functional groups in the pore channels

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Electronic Supplementary Information

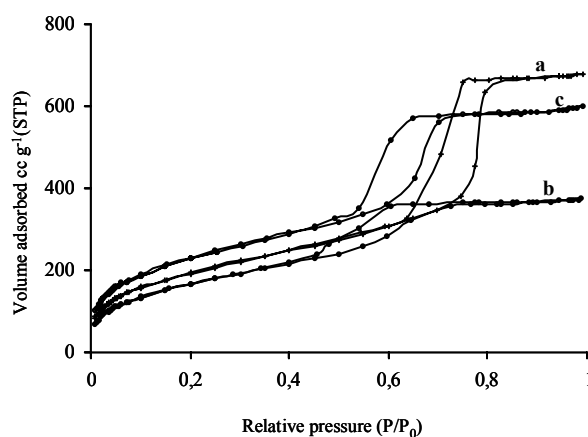


Figure 1S Nitrogen adsorption-desorption isotherms of SBA-¹⁰acac (a), SBA-¹⁰SH (b) and SBA-¹⁴acac,SH (c).

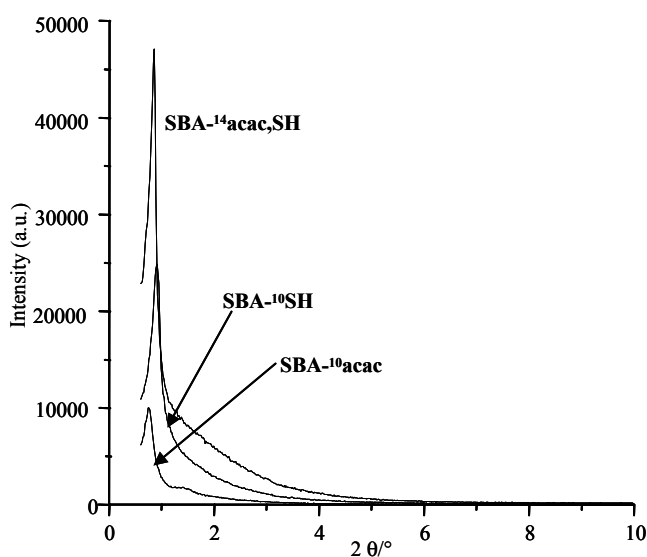


Figure 2S XRD patterns of SBA-¹⁰acac, SBA-¹⁰SH and SBA-¹⁴acac,SH.

Table S1. Composition and physicochemical characteristics of materials **SBA^x-acac**, **SBA^x-SH**, **SBA^x-CN** and **SBA^x-NH₂**

entry	sample	$a_0(\text{nm})^a$	S_{BET} ($\text{m}^2 \text{g}^{-1}$)	V_p ($\text{cm}^3 \text{g}^{-1}$)	D_p^b (nm)	d_{100} (nm)	Wall thickness ^c (nm)	Si/Z ^d	Org. group content (mmol g^{-1})
1	SBA⁵-acac	14.90	763	1.28	7.44	12.90	7.46	Z = C 0.92 (1.07)	0.71
2	SBA¹⁰-acac	13.30	675	1.04	6.87	11.50	6.43	Z = C 0.41 (0.51)	1.30
3	SBA¹⁴-acac	9.20	600	0.70	6.25	8.00	2.95	Z = C 0.24 (0.37)	1.70
4	SBA⁵-SH	13.80	669	0.90	5.26	11.90	8.54	Z = S 19.12 (20)	0.74
5	SBA¹⁰-SH	10.90	583	0.58	3.85	9.50	7.05	Z = S 8.98 (10)	1.30
6	SBA¹⁴-SH	10.20	569	0.44	3.20	8.80	7.00	Z = S 5.80 (7)	1.92
7	SBA⁵-CN	13.72	710	1.50	8.57	11.82	5.15	Z = N 18.99 (20)	0.73
8	SBA¹⁰-CN	13.55	628	1.26	7.67	11.73	5.88	Z = N 8.80 (10)	1.32
9	SBA¹⁴-CN	12.20	532	1.06	5.74	10.56	6.73	Z = N 5.89 (7)	1.85
10	SBA⁵-NH₂	12.4	524	1.37	8.38	10.74	4.02	Z = N 23.31 (20)	0.52
11	SBA¹⁰-NH₂	12.08	563	1.11	6.37	10.47	5.71	Z = N 12.79 (10)	1.00
12	SBA¹⁴-NH₂	10.84	583	1.10	5.30	9.38	5.54	Z = N 8.71 (7)	1.50

^aLattice spacing. ^bCalculated from the desorption branch by the BJH method. ^cCalculated by a_0 – pore size ($a_0 = 2d_{100} / 3^{1/2}$). ^dCalculated from elemental analyses. In parentheses, theoretical values.

Table 2S. Composition and physicochemical characteristics of materials **SBA⁵-CO₂H** and **SBA⁵-SO₃H**

sample	a_0^a (nm)	S_{BET} (m ² g ⁻¹)	V_p (cm ³ g ⁻¹)	D_p^b (nm)	d_{100} (nm)	Wall thickness ^c (nm)	Si/Z ^d
SBA⁵-CO₂H	13.29	633	1.45	8.91	11.5	4.38	Z = C 5.2 (5)
SBA¹⁰-CO₂H	13.20	531	1.26	8.67	11.44	4.53	Z = C 1.9 (2.5)
SBA¹⁴-CO₂H	10.75	399	0.89	6.01	9.35	4.74	Z = C 1.6 (1.75)
SBA⁵-SO₃H	13.06	642	0.75	4.87	11.3	8.19	Z = S 19.78 (20)
SBA¹⁰-SO₃H	10.64	537	0.41	2.94	9.21	7.70	Z = S 10.5 (10)
SBA¹⁴-SO₃H	9.89	499	0.37	2.43	8.56	7.46	Z = S 6.45 (7)

^aLattice spacing. ^bCalculated from the desorption branch by the BJH method. ^cCalculated by a_0 – pore size ($a_0 = 2d_{100} / 3^{1/2}$). ^dCalculated from elemental analyses. In parentheses, theoretical values.

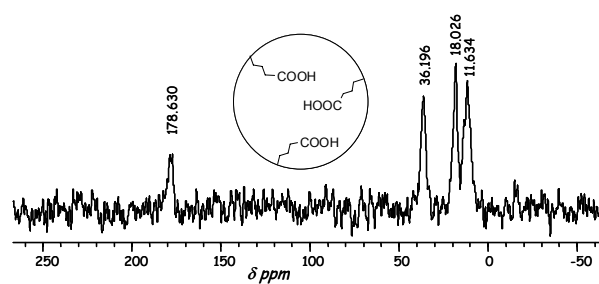


Fig. 3S CP-MAS ¹³C NMR spectrum of SBA¹⁰-COOH.