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Rational Design of Hierarchical Macroporous-Mesoporous Magnesium Silicate for Highly Efficient Removal of Organic Dye and Pb^{2+}

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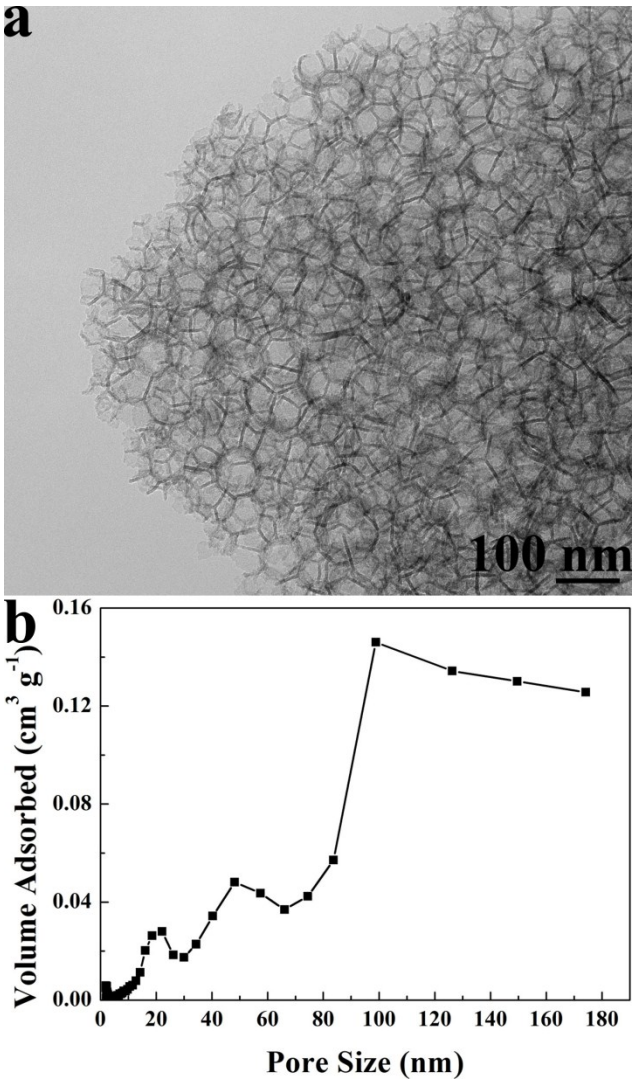

Fig. S1 (a) The TEM image and pore size distribution curve of MOSF

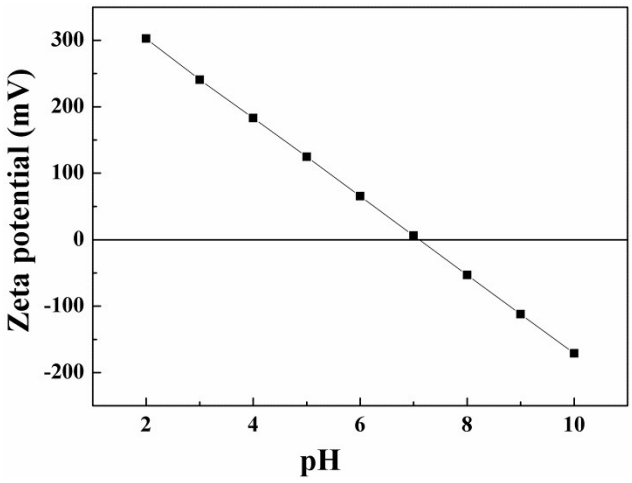

Fig. S2 Zeta potential of MB molecules as a function of pH.

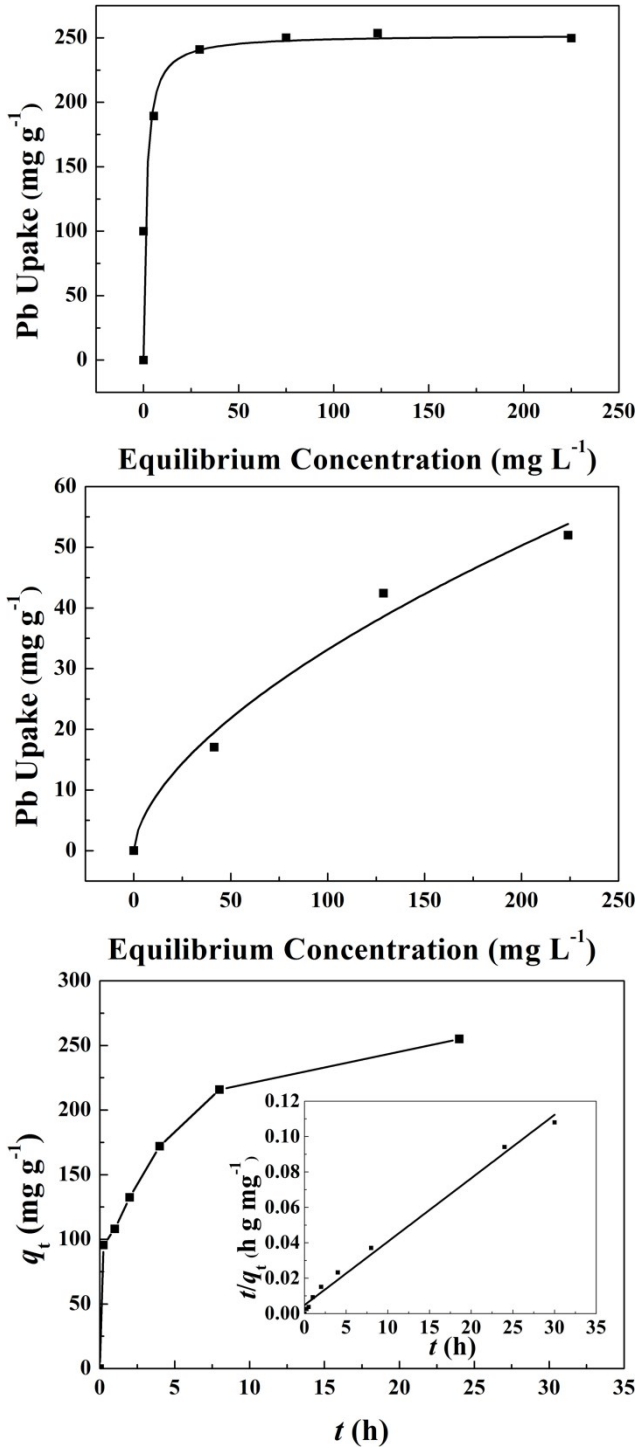

Fig. S3 Pb^{2+} adsorption isotherms of (a) HMMgS and (b) MOSF; (c) kinetic isotherm of Pb^{2+} for HMMgS. The inset of (c) is is the plot of t/q_t versus t using linear regression.

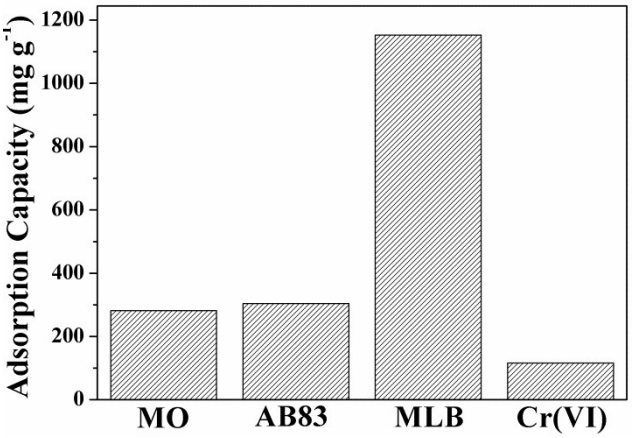

Fig. S4 Adsorption capacities of HMMgS for methyl orange (MO), acid blue 83 (AB83), methyl blue (MLB) and Cr(VI). The initial concentrations of dyes and Cr (VI) are 600 mg L^{-1} and 350 mg L^{-1}, repectively. The adsorption time is 24 h. The dosage of HMMgS is 0.5 g L^{-1}.

Table S1 MB adsorption properties of MOSF, HMMgS and related adsorbents reported in literatures

Adsorbent	S_{BET} (m^2 g^{-1})	Pore size (nm)	Pore volume (cm^3 g^{-1})	Q_{max} (mg g^{-1})	Q_{max}/S_{BET} (mg m^{-2})	Ref.
Mesoporous magnesium silicate	446	3.8, 5.7	0.84	382	0.85	1
Magnesium silicate hollow nanofibers	632.2	---	0.92	197	0.31	2
magnesium silicate/reduced graphene oxide nanocomposite	450	---	---	433	0.96	3
Magnesium silicate nanotube	588	7.13	1.05	299	0.51	4
Magnesium silicate hollow sphere	521	3-5	---	207	0.40	5
Mesoporous magnesium silicate-silica	432	5.46, 55	0.84	283	0.74	6
Yolk-shell magnetic magnesium silicate	293	2.3	---	188	0.64	7
Magnesium silicate nanotube	604	3.82	0.85	276	0.46	8
Copper silicate hollow sphere	270	3.2	0.6	162	0.60	9
CNTs-A	534.6	12	1.61	400	0.75	10
natural sepiolite	342	---	---	58	0.17	11
MOSF	265	98	1.26	115	0.26	This work
HMMgS	565	140-190, 5.8	0.94	602	1.06	This work

Note: S_{BET} is the surface area calculated using the Brunauer–Emmett–Teller (BET) method and Q_{max} is the maximum adsorption amount (mg g^{-1}).

Table S2 The equilibrium times of adsorbents for the removal of MB and Pb^{2+} reported in literatures..

Adsorbent	Dye/Heavy metals	t_{eq} (min)	Ref
silica nano-sheets	Methylene blue	≧180	12
3D hierarchically porous carbon	Methylene blue	600	13
natural sepiolite	Methylene blue	200	11
carbon nanotube sheets	Pb^{2+}	≧4200	14
HMMgS	Methylene blue	120	This work
HMMgS	Pb^{2+}	960	This work

Note: t_{eq} is the time needed to reach adsorption equilibrium.

Table S3 Adsorption parameters of Langmuir model and pseudo-second-order adsorption kinetic constants for Pb^{2+} adsorption

Samples	Langmuir model			Pesudo-second-order kinetic model			
	Q_{max} (mg g^{-1})	b (L mg^{-1})	R^2	K_2 (g mg^{-1} h^{-1})	v_0 (mg g^{-1} h^{-1})	Q_{eq} (mg g^{-1})	R^2
HMMgS	253	0.684	0.942	0.0027	208.3	277.8	0.993

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