Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

Controllable synthesis of hierarchical mesoporous/microporous nitrogen-rich polymer networks for CO_2 and Cr (VI) ion adsorption

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Isosteric heat of CO_2 adsorption

To ascertain the strength of the interaction between CO_2 molecules and the MRT network, the isosteric heat of CO_2 sorption, Q_{st}, was calculated using CO_2 sorption isotherms measured at 273 and

298K. The Q_{st} (kJ/mol) at a given surface loading (q_e) is calculated from the Clausius–Clapeyron equation as

$$\left(\frac{\partial(\ln P)}{\partial(1/T)}\right)_{q_a} = -\frac{Q_{st}}{R} \qquad (1)$$

where P is CO_2 partial pressure (Pa), T is the absolute temperature (K), and R denotes the universal gas constant, 8.314 J•mol^{-1}•K^{-1}.

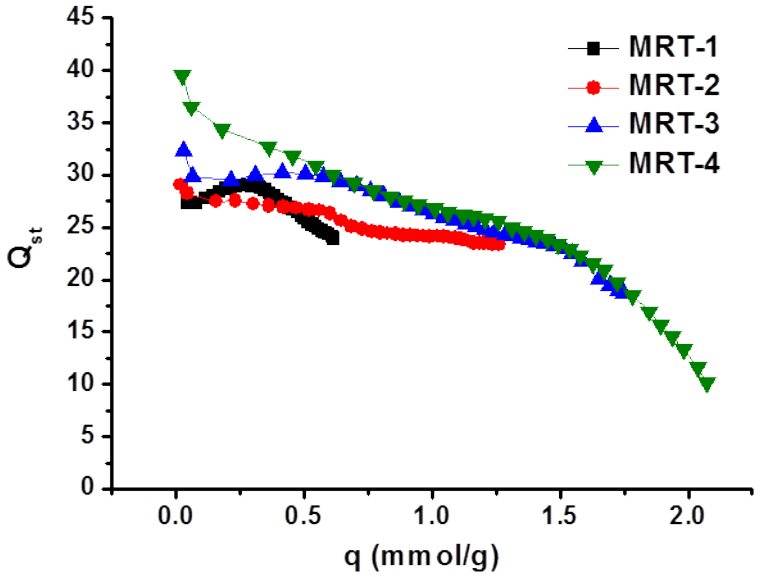

Figure S1. Isosteric heats of adsorption for CO_2 calculated from the uptakes at 273 and 298 K for the MRT networks

Equilibrium adsorption modeling for Cr (VI) adsorption

The equilibrium adsorption isotherm is of importance in the design of adsorption systems. The

Langmuir adsorption model was often used to describe sorption of a solute from a liquid solution given as Eq. (2),

$$\frac{C_e}{q_e} = \frac{1}{bq_m} + \frac{C_e}{q_m} \qquad (2)$$

where C_e is the concentration of Cr(VI) in the solution at equilibrium (mg/L), q_e is the amount of Cr(VI) adsorbed per unit mass of the MRT network (mg/g), q_m indicates the monolayer adsorption capacity of Cr(VI)/unit masss of the MRT networks and b is the Langmuir constant related to the energy of adsorption.

The Freundlich isotherm is mostly used to describe the adsorption of inorganic and organic components in solution. This fairly satisfactory empirical can be used for non ideal sorption that involves heterogeneous sorption and is expressed as Eq. (3),

$$q_e = K_f (C_e)^{1/n} \quad (3)$$

the logarithmic form is given as Eq. (4),

$$\log q_e = \log K_f + n \log C_e \quad (4)$$

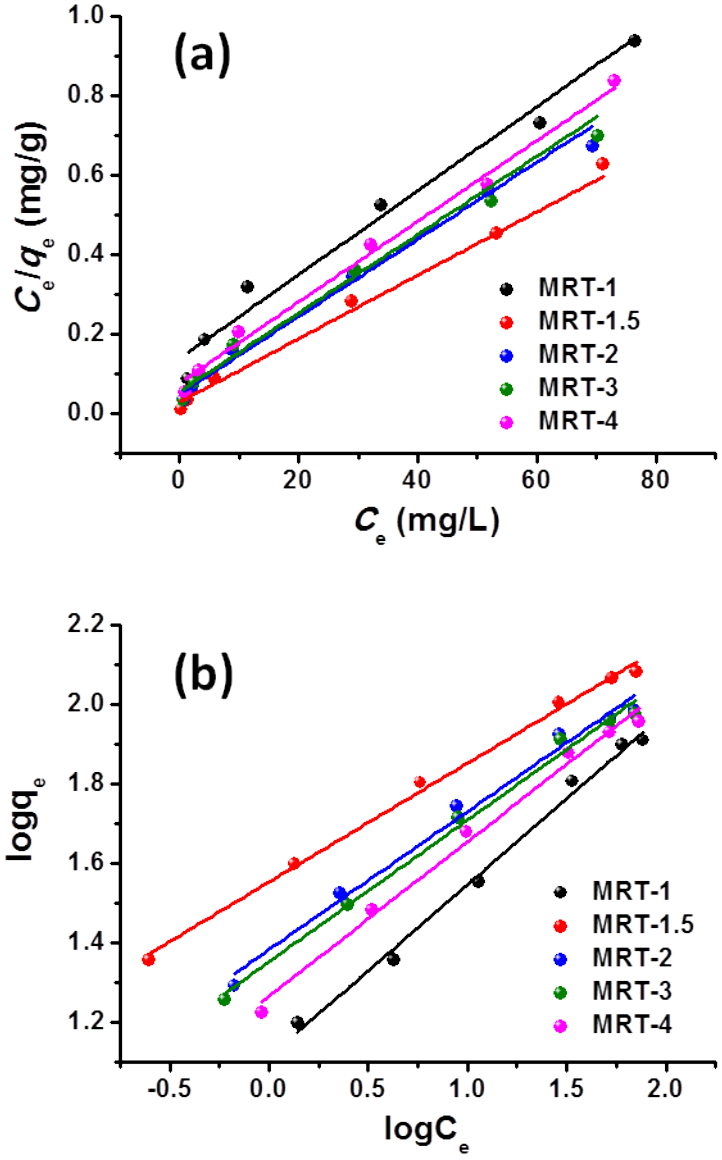

Figure S2 Fitting of Langmiur (a) and Freundlich (b) isotherms

Table 1 Langmiur and Freundlich isotherm parameters for Cr(VI) adsorption onto the MRT networks

Adsorbent	Langmuir			Freundlich		
	b (L/mg)	q_e (mg/g)	R_f1	K_f	n	R_f2
MRT-1	0.075	94.78	0.986	13.02	2.30	0.991
MRT-1.5	0.266	125.15	0.994	35.81	3.34	0.995
MRT-2	0.190	102.88	0.986	24.21	2.88	0.985
MRT-3	0.172	101.31	0.984	22.55	2.80	0.991
MRT-4	0.129	98.32	0.983	18.45	2.56	0.990