Electronic Supplementary Information

Functionalized mesoporous silica material and anionic dye adsorption: MCM-41 incorporated with amine groups for competitive adsorption of Acid Fuchsine and Acid Orange II

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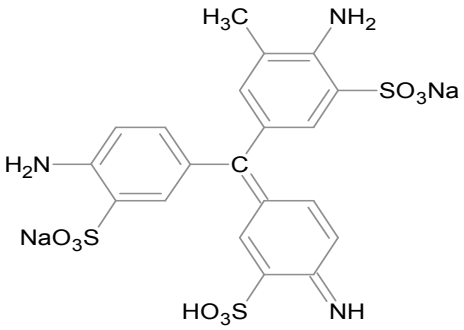
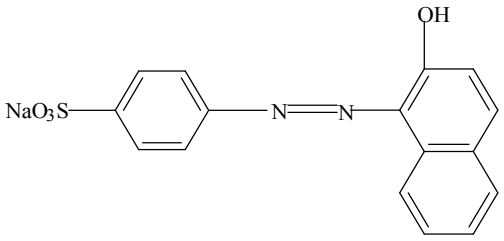


a: AF, $C_{20}H_{17}N_3Na_2O_9S_3$, molecular weight: 585.5



b: AO, $C_{16}H_{11}N_2Na0_4S$, molecular weight: 350.3

Fig. S1 Molecular structure of the selected basic anionic dyes for the current adsorption study. a: AF, b: AO.

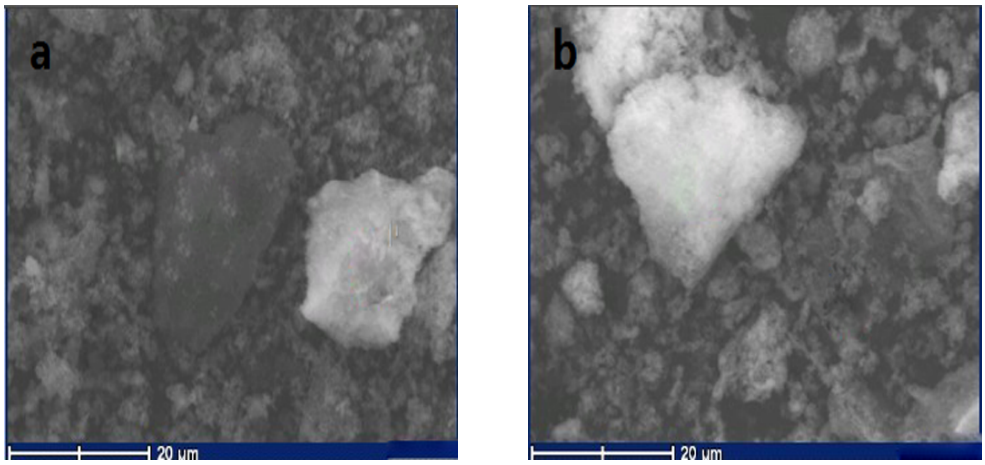


Fig. S2 SEM surface morphology. a: MCM-41, b: NH_2-MCM-41.

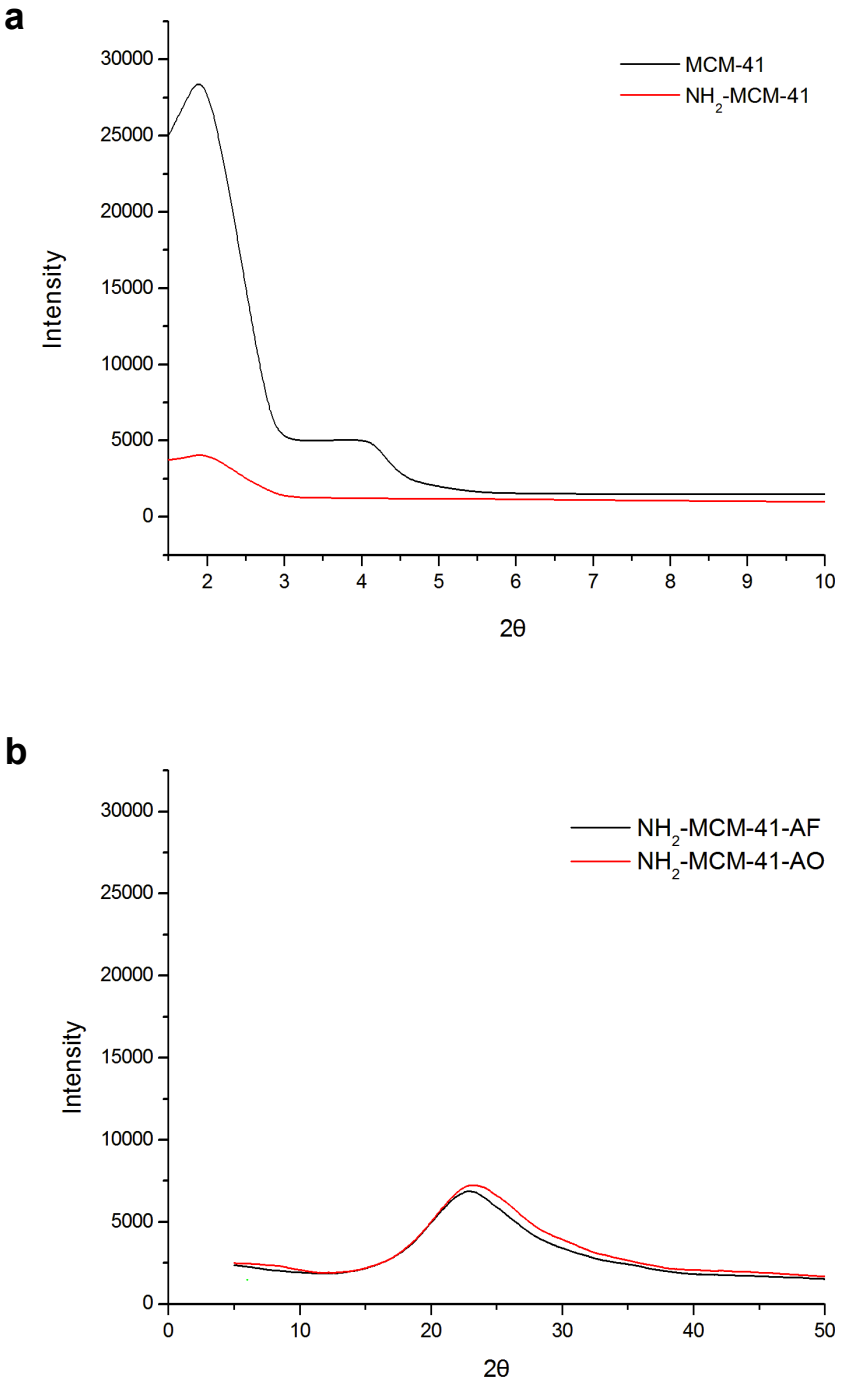


Fig. S3 (a) XRD pattern of MCM-41 and NH_2-MCM-41.

(b) XRD pattern of NH_2-MCM-41-AF and NH_2-MCM-41-AO.

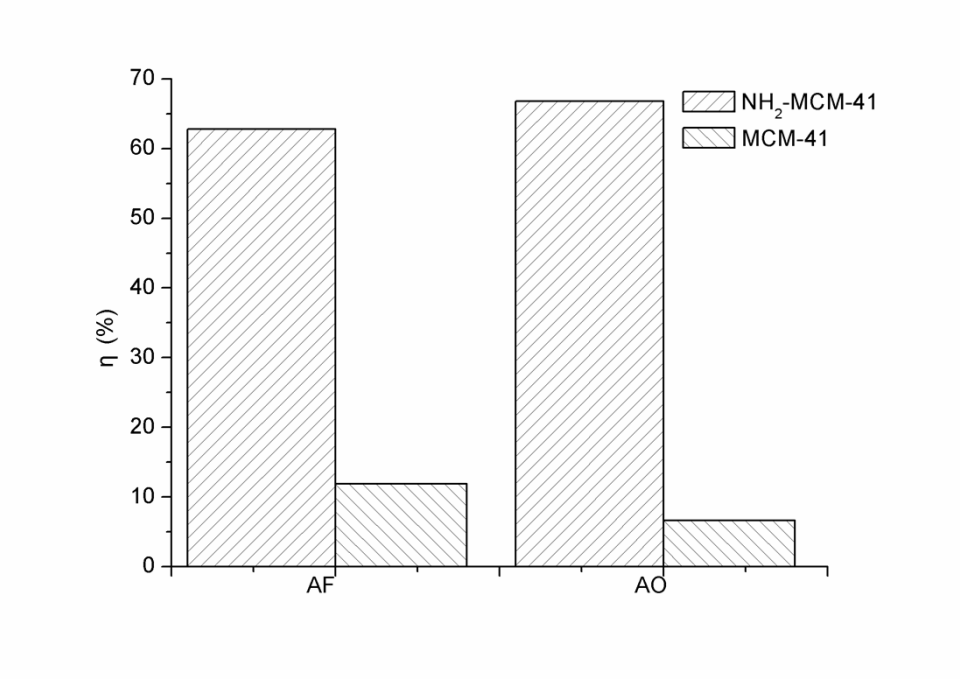
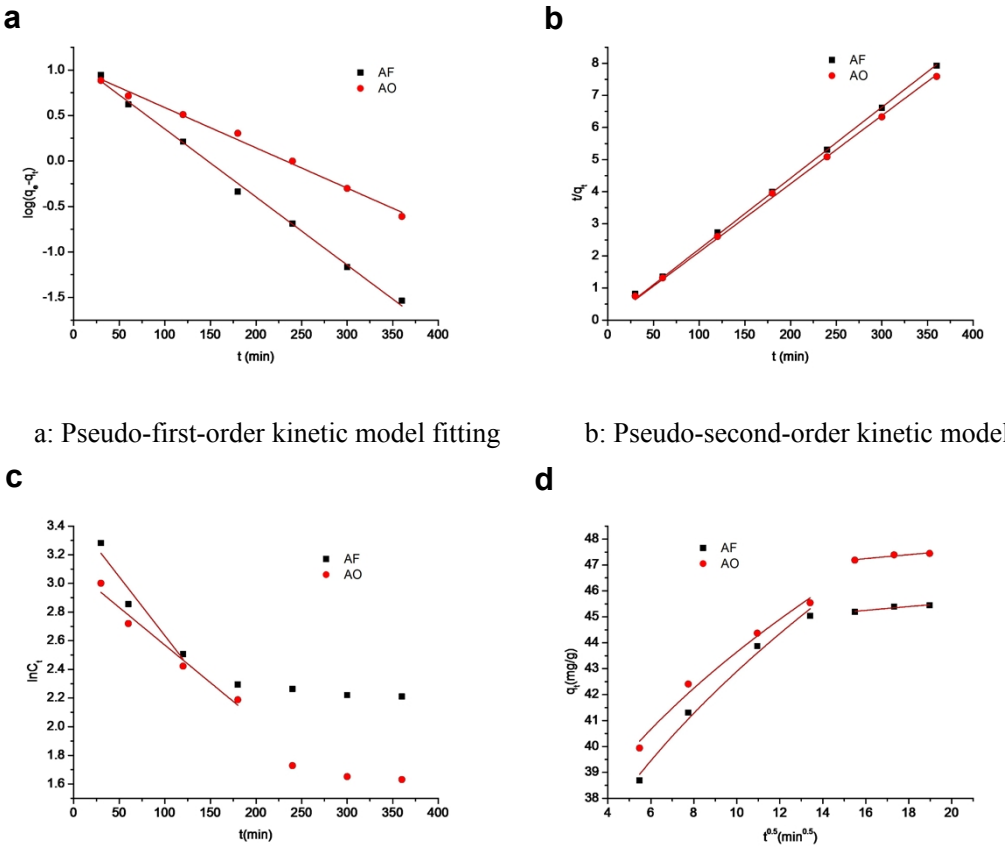


Fig. S4 The adsorptive removal ratios of AO and AF on MCM-41 before and after amine functionalization.



a: Pseudo-first-order kinetic model fitting b: Pseudo-second-order kinetic model fitting

c: Spahn and Schlunder model fitting d: Intraparticle diffusion model fitting

Fig. S5 Adsorption kinetics of AF and AO onto NH_2-MCM-41 in single component systems. a: Pseudo-first-order kinetic model fitting, b: Pseudo-second-order kinetic model fitting, c: Spahn and Schlunder model fitting, d: Intraparticle diffusion model fitting. (Conditions: pH 2.0 for AF and pH 3.0 for AO, 25 ^{o}C, NH_2-MCM-41 dosage 2.0 g/L.)

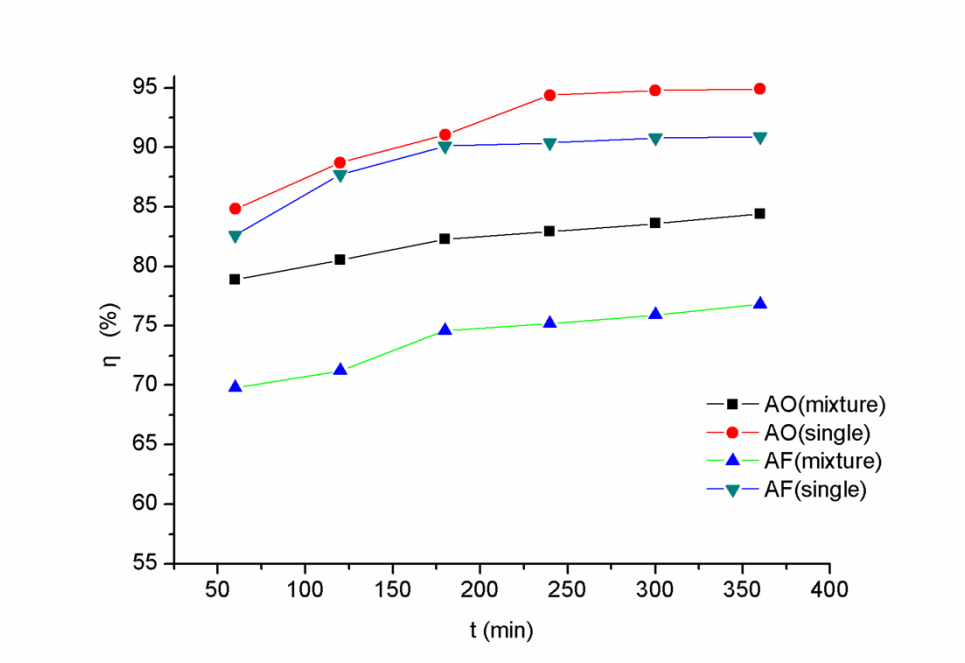


Fig. S6 Effect of contact time on adsorption of the two anionic dyes in binary component systems. (Conditions: pH 2.0, 25 °C, NH_2-MCM-41 dosage 2.0 g/L, dye concentration 100mg/L.)

Table S1 Adsorption isotherm constants for adsorption of AO and AF onto NH_2-MCM-41 at various temperatures in binary component systems.

Dyes	Temperature(°C)	Langmuir			Freundlich		
		q_m	K_L	R^2	K_F	n	R^2
AF	25	75.4620	0.0365	0.9986	5.6680	1.7916	0.9811
AO	25	75.8369	0.0786	0.9903	10.6100	2.1176	0.9245

Table S2 Kinetic parameters for adsorption of AF and AO onto NH_2-MCM-41 in binary component systems.

Dyes	Pseudo-first-order kinetic model			Pseudo-second-order kinetic model			Spahn and Schlunder model		Intraparticle diffusion model			
	k_1	q_e	R^2	k_2	q_e	R^2	k_{ext}	R^2	$k_{p.2}$	R^2	$k_{p.3}$	R^2
AF	0.0056	1.6291	0.9678	0.0672	18.9268	0.9974	0.0014	0.8778	1.3036	0.7724	0.9682	0.9818
AO	0.0048	1.4580	0.9889	0.0307	20.8688	0.9988	0.0015	0.9964	0.9559	0.9660	0.8756	0.9858