Cr(III) Adsorption on green mesoporous silica: Effect of amine functionalization and pH

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SUPPLEMENTARY MATERIALS

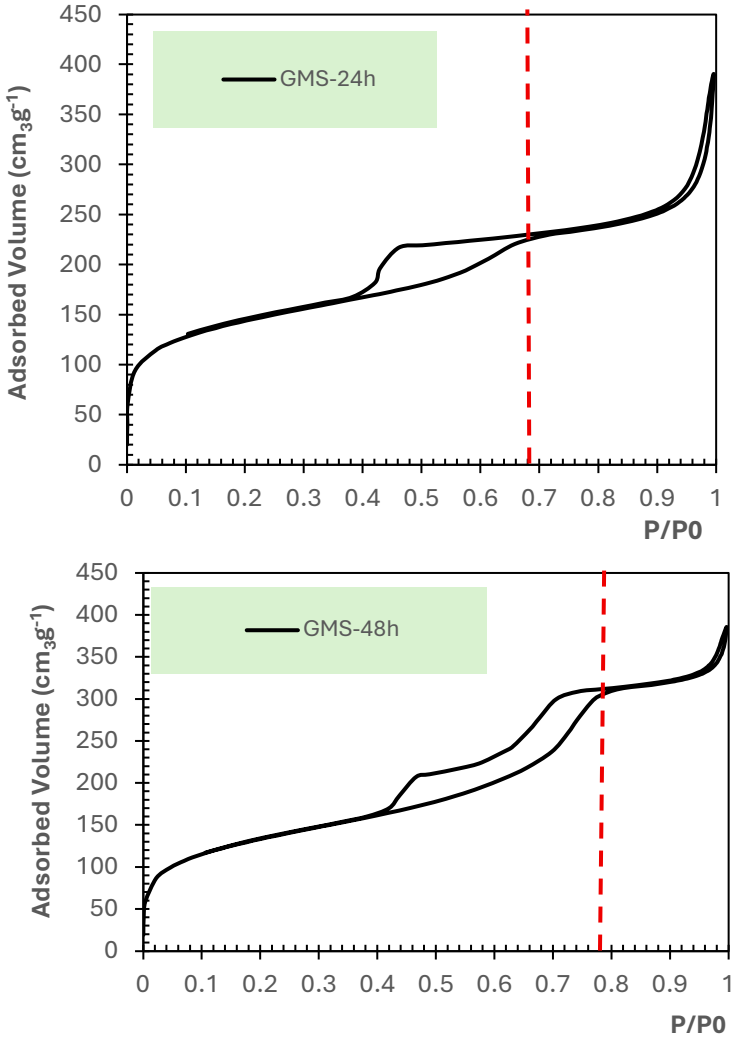


Figure S1 N2 adsorption-desorption isotherm for GMS to different aging times

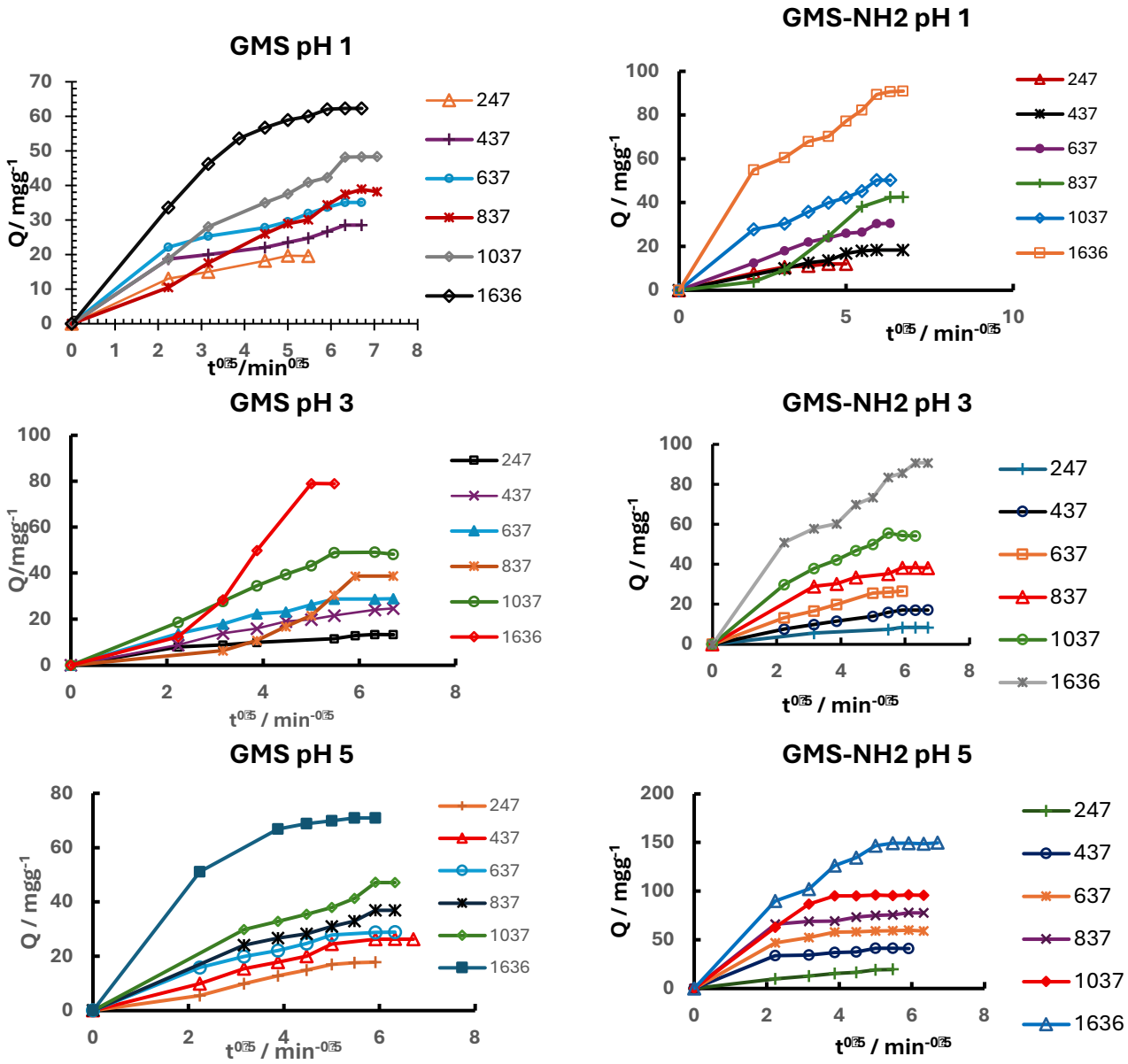


Figure S2 Intraparticle Diffusion model.

Table S1 Data fits for the PFO kinetic model form GMS-24h and GMS-24h-NH_2.

		GMS-24h						GMS-24hNH_2					
pH	$[Ag(I)]_0$ mgL^{-1}	247	437	637	837	1037	1636	247	437	637	837	1037	1636
1	Qe^{exp} $[mgg^{-1}]$	19.66	28.5	35	38.9	48.2	62	12.1	28.5	30.3	42.5	50.2	90.61
	Qe^{cal} $[mgg^{-1}]$	19.62	21.18	37.6	50.36	41.54	52.47	14.6	21.18	30.65	55.61	40.67	96.64
	K_1 $[min^{-1}]$	0.148	0.068	0.0792	0.0817	0.0568	0.0242	0.044	0.1124	0.0845	0.0741	0.0691	0.1022
	R_2	0.9128	0.9355	0.9411	0.9599	0.9838	0.9922	0.9575	0.9035	0.9574	0.9057	0.9662	0.9181
	Δq(%)	9.5	37.98	31.81	49.87	26.78	21.29	21.66	50.38	6.4	27.07	31.27	15.35
3	Qe^{exp} $[mgg^{-1}]$	13.3	24.1	28.8	-	49	78.9	8.4	17.12	26.6	38.34	54.3	90.68
	Qecal $[mgg^{-1}]$	9.17	23.82	60.98	-	49	155.63	10.52	16.27	18.78	49.27	46.27	78.72
	K_1 $[min^{-1}]$	0.0649	0.0762	0.1789	-	0.0831	0.1697	0.1273	0.0776	0.1291	0.1276	0.09372	0.0739
	R_2	0.9054	0.9913	0.8781	-	0.997	0.8984	0.8601	0.9564	0.9734	0.8884	0.9819	0.9422
	Δq(%)	41.35	0.3186	26.44	-	4.47	263.93	24.20	14.92	20.28	29.62	23.26	25.13

5	Qe^{exp} [mgg^{-1}]	17.6	26.3	28.7	36.2	47.2	70.89	19.56	41.2	59.12	77.7	95.87	149.03
	Qe^{cal} [mgg^{-1}]	22.87	28.56	24.38	35.93	40.63	56.76	16.87	38.01	30.70	35.94	60.67	184.84
	K_1 [min^{-1}]	0.1236	0.095	0.0907	0.0025	0.0637	0.1686	0.0654	0.1768	0.1596	0.1002	0.135	0.1607
	R_2	0.9245	0.9155	0.9649	0.818	0.9641	0.9898	0.9905	0.7857	0.9513	0.8532	0.945	0.9471
	Δq(%)	49.085	49.06	190	92.12	6.47	3.21	5.35	13.24	11.44	14.4	18.91	29.85

Table S2 Data fits the PSO kinetic model form GMS-24h and GMS-24h-NH_2.

		GMS-24h						GMS-24hNH_2					
pH	$[Ag(I)]_0$ mgL^{-1}	247	437	637	837	1037	1636	247	437	637	837	1037	1636
1	Qe^{exp} $[mgg^{-1}]$	19.66	28.5	35	38.9	48.2	62	12.1	18.4	30.3	42.5	50.2	90.61
	Qe^{cal} $[mgg^{-1}]$	20.57	29.3	36.5	46.29	45.66	66.22	12.73	20.7	33.67	27.32	53.7	97
	K_2 $[gmg^{-1}min^{-1}]$	0.024	0.0096	0.008	0.0018	0.0048	0.0049	0.049	0.0074	0.0047	0.0036	0.0037	0.0023
	K_2qe $[min^{-1}]$	0.494	0.281	0.292	0.0833	0.219	0.324	0.624	0.153	0.158	0.098	0.198	0.223
	R_2	0.9872	0.9773	0.9834	0.9135	0.9646	0.9926	0.9949	0.9375	0.9537	0.735	0.9631	0.977
	$\Delta q(\%)$	8.9	7.7	6.4	13.7	14.3	8.7	8.1	12.5	10.2	54	9.1	8.1
	Rw	0.09	0.15	0.145	0.377	0.182	0.133	0.077	0.268	0.256	0.243	0.21	0.193
	Zone	II	I	I	I	I	I	II	I	I	I	I	I
3	Qe^{exp} $[mgg^{-1}]$	13.3	24.1	28.8	-	49	78.9	8.4	17.12	26.6	38.3	54.3	90.7

	Qe^{cal} [mgg-1]	14.1	27.7	31.9	-	55.9	78.7	8.8	19.3	29.6	40.1	59.2	98.0
	K_2 [$gmg^{-1}min^{-1}$]	0.0179	0.0045	0.0061	-	0.0026	0.0127	0.0396	0.0079	0.0071	0.0086	0.0046	0.0019
	K_2qe [min^{-1}]	0.252	0.125	0.194		0.145	0.999	0.348	0.152	0.210	0.345	0.272	0.186
	R_2	0.9814	0.9481	0.9755	-	0.9576	1	0.982	0.962	0.9796	0.9889	0.9801	0.9663
	$\Delta q(\%)$	0.384	10.66	9.52	-	8.5	0.51	8.75	10.28	10.39	5.64	9.97	9.86
	Rw	0.165	0.165	0.204	-	0.262	0.0475	0.131	0.269	0.209	0.131	0.1667	0.226
	Zone	I	I	I	-	I	I	I	I	I	I	I	I
5	Qe^{exp} [mgg^{-1}]	17.6	26.3	28.7	36.2	47.2	70.89	19.56	41.2	59.12	77.7	95.87	149.03
	Qe^{cal} [mgg^{-1}]	19.76	30.3	31.15	39.06	50	72.88	21.01	42.19	60.6	78.74	99	158.7
	K_2 [$gmg^{-1}min^{-1}$]	0.0097	0.0047	0.0321	0.0256	0.0038	0.0012	0.0118	0.0173	0.0186	0.0117	0.0087	0.0021
	K_2qe [min^{-1}]	0.192	0.142	0.999	0.999	0.19	0.087	0.248	0.729	1.127	0.921	0.861	0.333

	R_2	0.9292	0.9595	0.9797	0.9574	0.9451	0.9975	0.9722	0.9943	0.9987	0.9978	0.9966	0.9904
	$\Delta q(\%)$	12.7	28.5	7.7	7.9	8.6	29.7	10.2	4.2	4.3	2.7	10.2	8.0
	Rw	0.2068	0.2558	0.0514	0.047	0.208	0.345	0.168	0.064	0.042	0.0515	0.0548	0.1304
	Zone	I	I	II	II	I	I	I	II	II	II	II	I

Table S3 PSO Kinetic Study criteria for approaching equilibrium (Rw).

Rw	Zone	Observation
Rw=1	0	Type of Kinetic curve: line. System not approaching equilibrium
1>Rw>0.1	I	Type of Kinetic curve: slightly curved. System approaching equilibrium
0.1>Rw>0.01	II	Type of Kinetic curve: largely curved System well approaching equilibrium
Rw<0.01	III	Type of Kinetic curve: Pseudo-rectangular curved System drastically approaching equilibrium