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SUPPORTING INFORMATION

Enhanced Arsenic Removal from Aqueous Solutions Via Magnesium Hydroxide Coated Iron Nanoparticles

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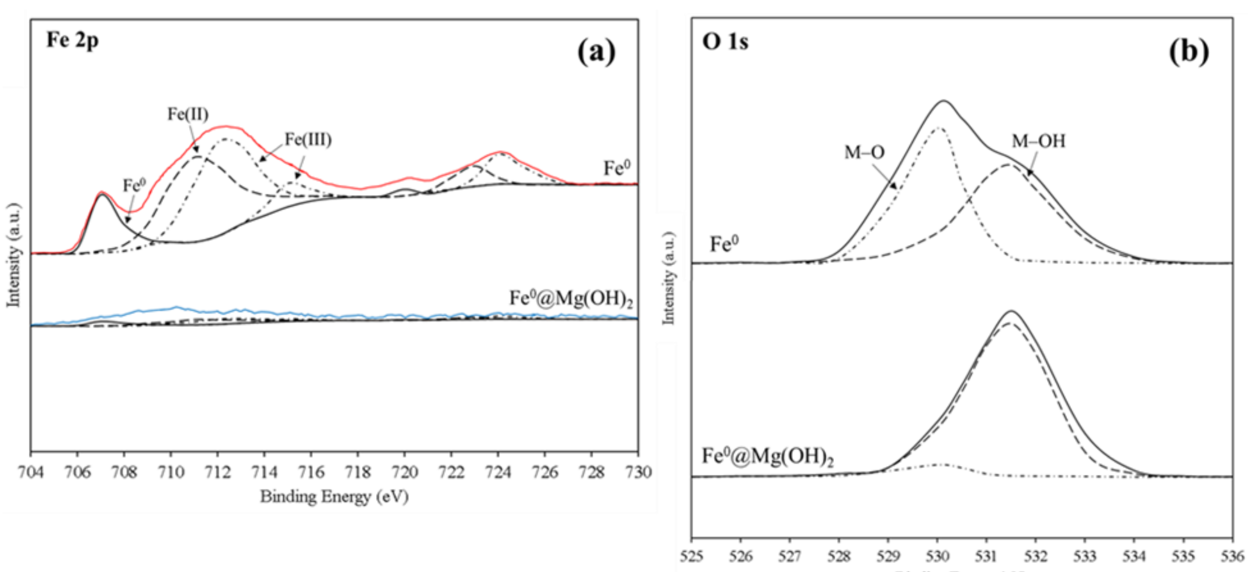

Fig. S1. XPS analysis of fresh (a) Fe 2p and (b) O 1s regions for the surface of nFe^0 and $nFe^0@Mg(OH)_2$ (100% coating ratio), adopted from [1].

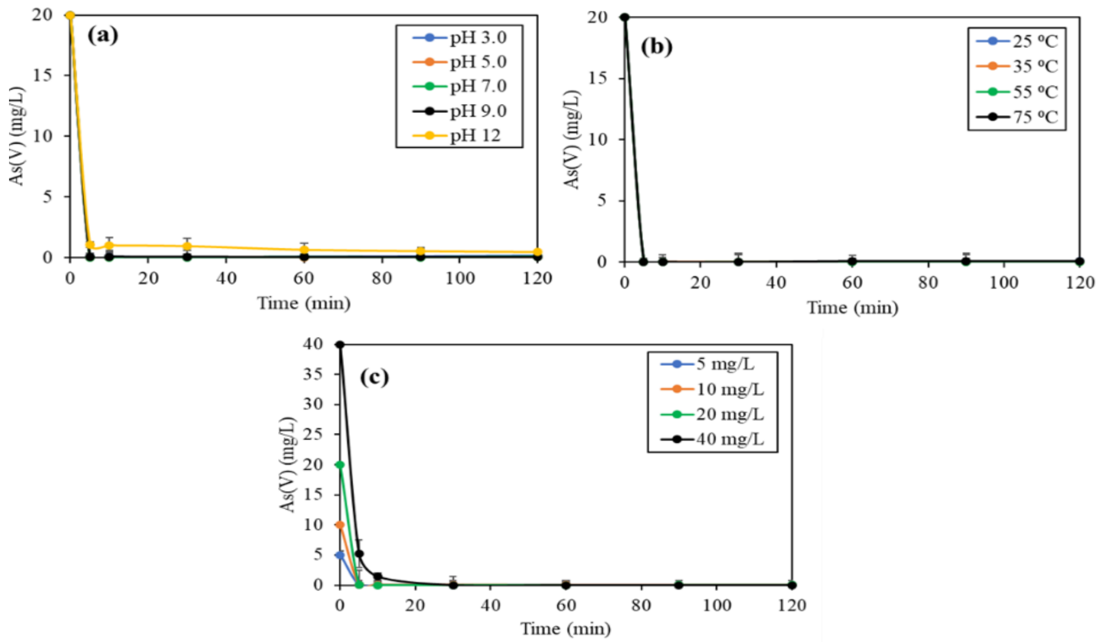

Fig. S2. Effect of initial pH (a), reaction temperature (b), and initial As(V) concentration (c) on As(V) removal by $nFe^0@Mg(OH)_2$-100% (1.0 g/L dosage).

Table S1. Calculated kinetics parameters for As(V) removal by nFe^0 and $nFe^0@Mg(OH)_2$.

Parameter	Exp.	Pseudo-first-order model				Pseudo-second-order model				Intraparticle diffusion model				Elovich model			
	q_e (mg/g)	k_1 (1/min)	q_e (mg/g)	R^2	AIC	k_2 (g/mg min)	q_e (mg/g)	R^2	AIC	k_{int} (mg/g $min^{0.5}$)	C_{int} (mg/g)	R^2	AIC	β (mg/g min)	α (g/mg)	R^2	AIC
nFe^0	39.891	0.270	37.642	0.993	13.161	0.013	39.442	0.998	2.071	2.912	14.99	0.778	33.71	0.304	89.452	0.988	38.34
Mg/Fe (25%)	33.801	0.278	30.061	0.969	20.112	0.015	31.951	0.984	16.341	2.507	11.17	0.821	30.15	0.310	967.643	0.995	9.711
Mg/Fe (50%)	38.400	0.338	35.384	0.993	12.824	0.022	36.623	0.995	11.575	2.636	15.204	0.742	33.882	0.400	743.524	0.989	36.293
Mg/Fe (100%)	39.894	0.305	38.740	0.999	4.008	0.017	40.164	1.000	-3.644	2.833	16.620	0.736	34.991	0.383	131.876	0.981	41.626
pH 3.0	39.961	0.508	39.492	0.999	3.093	0.048	40.218	1.000	-9.433	2.646	19.309	0.662	36.648	0.626	215.472	0.967	45.923
pH 5.0	39.894	0.305	38.740	0.999	4.008	0.017	40.164	1.000	-3.644	2.833	16.620	0.736	34.991	0.359	549.725	0.990	37.672
pH 7.0	38.780	0.334	36.146	0.994	12.007	0.020	37.509	0.997	7.828	2.706	15.440	0.748	34.003	0.394	783.245	0.993	36.512
pH 9.0	39.882	0.198	35.037	0.980	19.114	0.008	37.685	0.990	14.933	3.024	11.340	0.860	30.475	0.215	159.078	0.996	9.480
pH 12.0	37.601	0.133	33.045	0.976	19.685	0.005	36.835	0.990	14.238	3.083	8.029	0.918	26.890	0.165	23.420	0.996	9.177
25 °C	39.894	0.305	38.740	0.999	4.008	0.017	40.164	1.000	-3.644	2.833	16.620	0.736	34.991	0.370	81.925	0.976	42.090
35 °C	40.0	0.325	39.026	0.999	2.620	0.020	40.321	1.000	-4.301	2.805	17.176	0.722	35.361	0.413	435.180	0.986	40.773
55 °C	40.0	0.466	39.400	0.999	1.644	0.040	40.200	1.000	-35.397	2.670	18.973	0.672	36.443	0.640	303.146	0.974	45.665
75 °C	40.0	0.745	39.957	1.000	-25.260	0.188	40.134	1.000	-19.842	2.528	20.673	0.620	37.447	0.720	136.428	0.947	47.283
Dosage 0.25 g/L	39.201	0.143	37.767	0.996	11.348	0.005	41.190	0.990	15.839	0.165	46.969	0.975	21.419	3.254	10.694	0.851	31.870
Dosage 0.5 g/L	39.894	0.305	38.740	0.999	4.008	0.017	40.164	1.000	-3.644	0.383	131.92	0.981	41.625	2.833	16.620	0.736	34.991
Dosage 1.0 g/L	40.0	1.304	40.000	1.000	-113.21	3.407	40.009	1.000	-47.674	2.590	137.42	0.955	50.065	2.491	21.043	0.607	37.657
Dosage 2.0 g/L	40.0	2.918	40.000	1.000	-134.92	763.94	40.000	1.000	-103.04	2.576	819.32	0.968	49.833	2.489	21.063	0.607	37.668
C_0 (5 mg/L)	9.859	0.358	9.733	0.999	-16.444	0.096	10.011	1.000	-23.734	0.682	4.434	0.702	19.080	1.715	201.457	0.986	23.748
C_0 (10 mg/L)	19.847	0.299	19.404	0.997	1.563	0.033	20.162	1.000	-11.990	1.427	8.255	0.740	26.601	0.734	374.188	0.992	29.001
C_0 (20 mg/L)	39.894	0.305	38.740	0.999	4.008	0.017	40.164	1.000	-3.644	2.833	16.620	0.736	34.991	0.359	554.238	0.990	37.656
C_0 (40 mg/L)	70.200	0.187	64.571	0.992	20.863	0.004	69.281	0.995	18.591	5.424	21.165	0.842	38.451	0.118	292.593	0.991	21.507

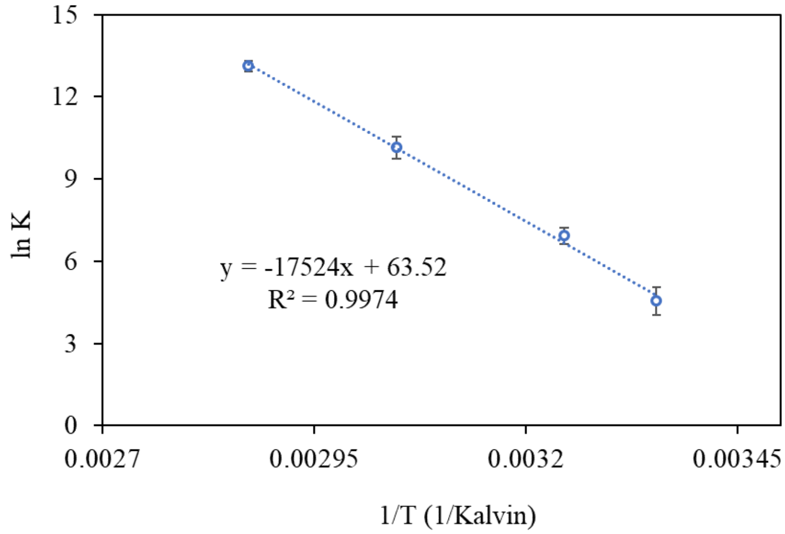

Fig. S3. Van 't Hoff plot of thermodynamic analysis for As(V) removal by $nFe^0@Mg(OH)_2$-100%.

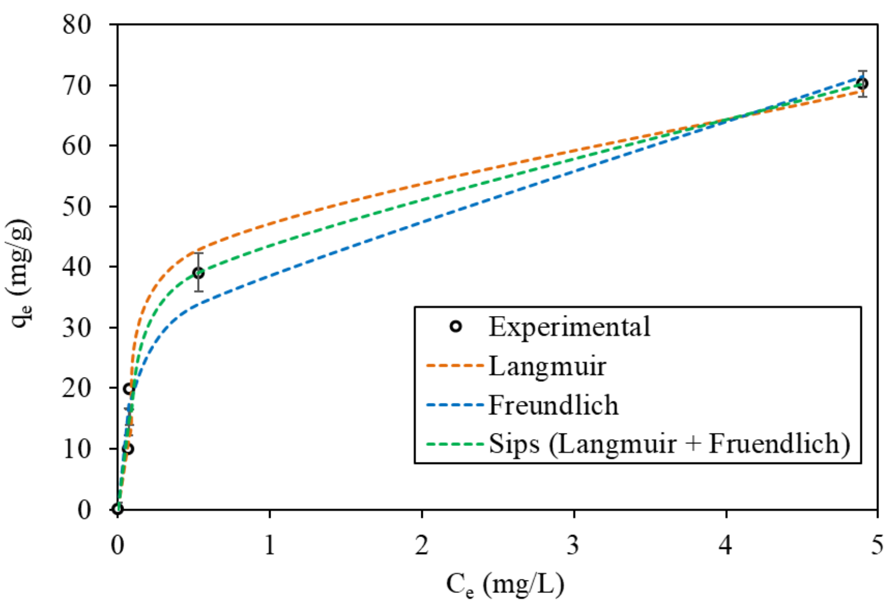

Fig. S4. Non-linear adsorption isotherms for As(V) removal by $nFe^0@Mg(OH)_2$-100%.

Table S2. Separation factor calculations for Langmuir isotherm.

Initial As(V) concentration (mg/L)	R_L
0	1
5	0.072692
10	0.037717
20	0.019221
40	0.009704

Table S3. Comparison on the maximum sorption capacity of the reported iron-based materials to As(V).

Reference*	Material	Maximum sorption capacity (mg/g)
[2]	nFe^0	50.29**
	S- nFe^0	95.76**
[3]	F- nFe^0	90.4
[4]	N-S- nFe^0	125**
[5]	Fe_3O_4-reduced graphite oxide-MnO_2	12.22
[6]	Ultrafine δ-FeOOH	37.3
[7]	Zr-doped β-FeOOH	60
[8]	Fe_3O_4 nanoparticles	46.06
[9]	Fe–Cu LDH	82.7
[10]	Fe-Al LDH	37.9
[11]	Fe_3O_4 coated wheat straw	8.1
[12]	Fe_3O_4/graphene	180.3**
This study	$nFe^0@Mg(OH)_2$	89.97

*The chosen references for the comparison were selected according to the best fitting to the reaction conditions in the present work, and **higher As(V) concentration (up to 600 mg/L).

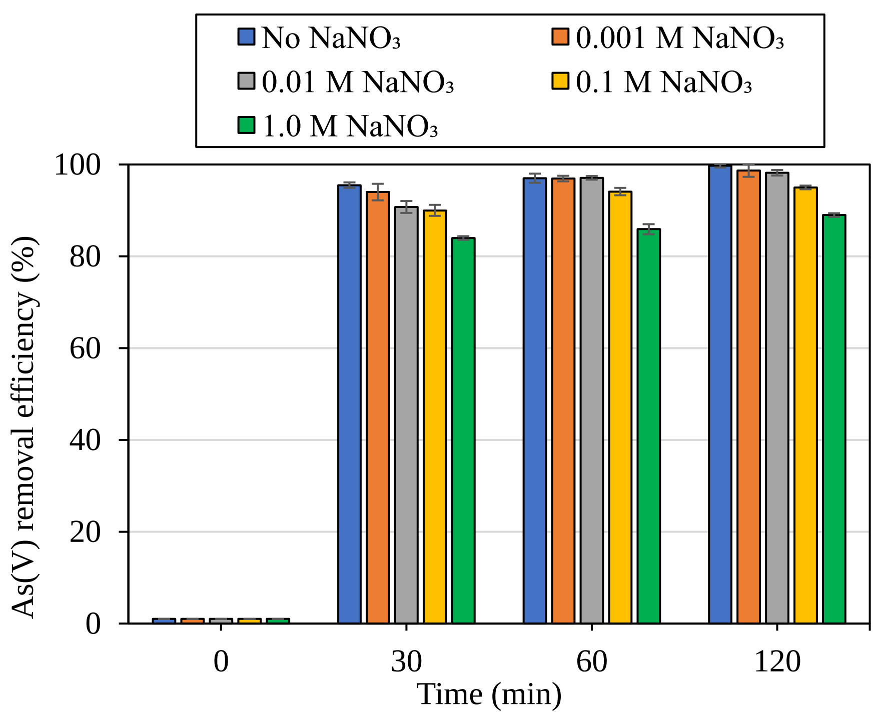

Fig. S5. As(V) removal by $nFe^0@Mg(OH)_2$-100% at different ionic strengths (0.001 – 1.0 M $NaNO_3$) (0.5 g/L dosage, and initial As(V) concentration 20 mg/L).

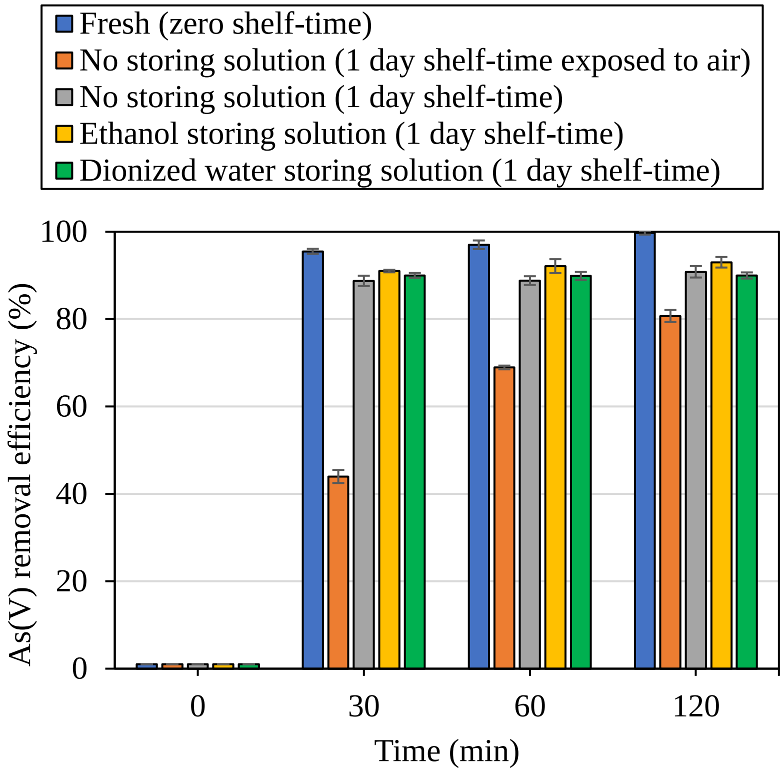

Fig. S6. As(V) removal by $nFe^0@Mg(OH)_2$-100% considering different storing conditions (0.5 g/L dosage, and initial As(V) concentration 20 mg/L).

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