Electronic Supplementary Information (ESI) for

Carbon Nanosphere–Iron Oxide Nanocomposites as High-Capacity Adsorbents for Arsenic Removal

Hui Su,[1] Zhibin Ye,[1,2*] Nuri Hmidi,[3] and Ramesh Subramanian[1]

1. Bharti School of Engineering, Laurentian University, Sudbury, Ontario P3E 2C6, Canada
2. Department of Chemical and Materials Engineering, Concordia University, Montreal, Quebec H3G 1M8, Canada
3. Goldcorp Incorporated, Red Lake Gold Mines, 15 Mine Road, Box 2000, Balmertown, Ontario P0V 1C0, Canada

* Corresponding author. Email: zye@laurentian.ca or zhibin.ye@concordia.ca.

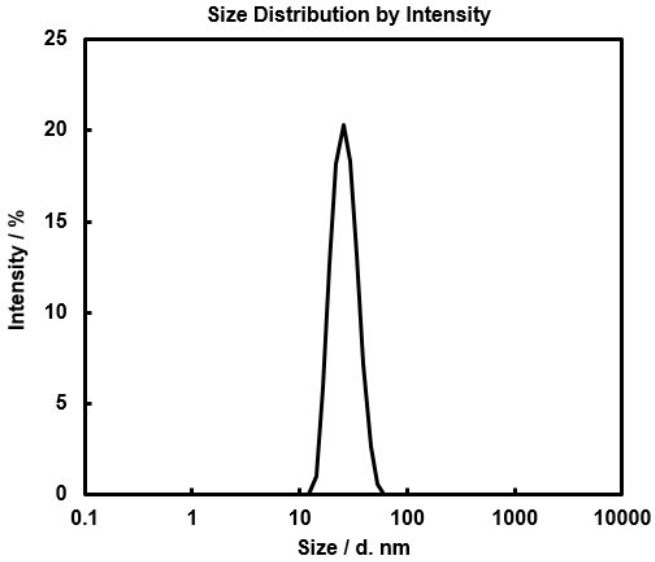

Figure S1. Size distribution (average size: 27 nm; PDI: 0.19) of poly(DEB) polymer nanospheres obtained by catalytic emulsion polymerization by DLS measurement.

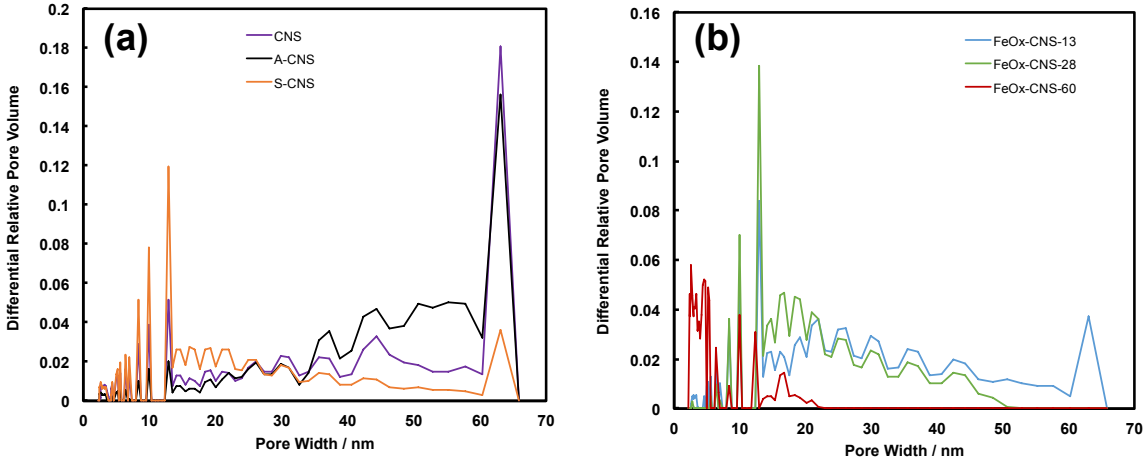

Figure S2. Mesopore/macropore size distributions (obtained by DFT model) of (a) CNS, A-CNS, and S-CNS; (b) three FeO_x-CNS composites.

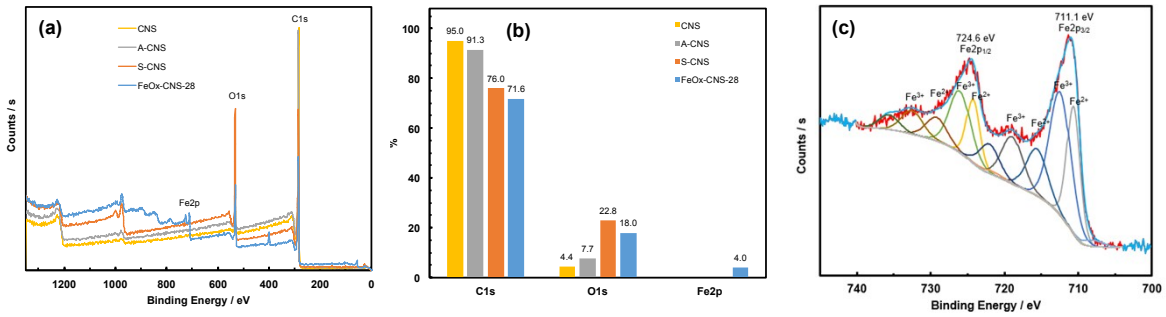

Figure S3. (a) XPS survey scan of CNS, A-CNS, S-CNS, and FeO_x-CNS-28; (b) The content of C, O, and Fe in CNS, A-CNS, S-CNS, and FeO_x-CNS-28 determined by XPS; (c) high-resolution Fe_{2p} spectra of FeO_x-CNS-28.

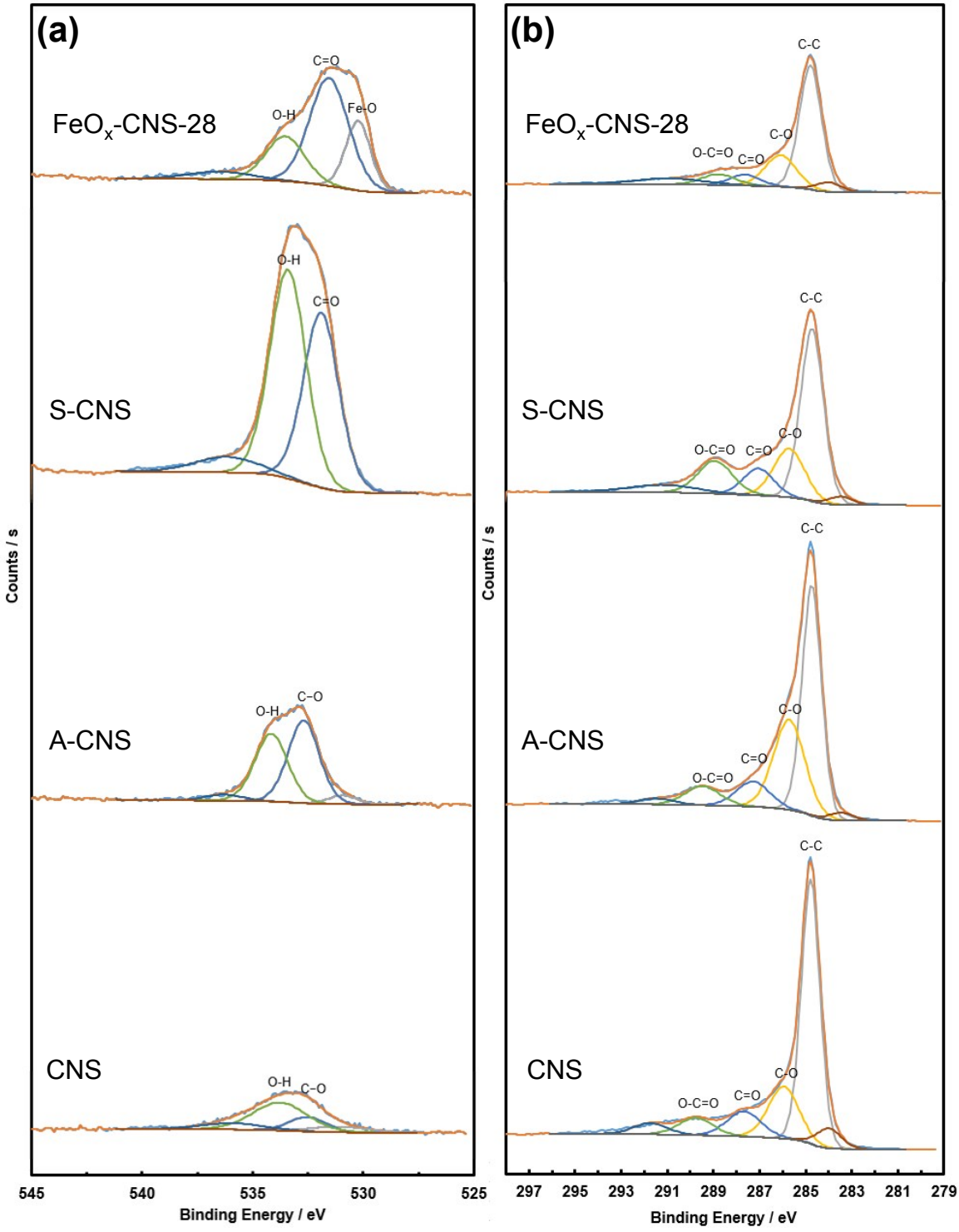

Figure S4. The O_{1s} (a) and C_{1s} (b) spectra of CNS, A-CNS, S-CNS and FeO_x-CNS-28.

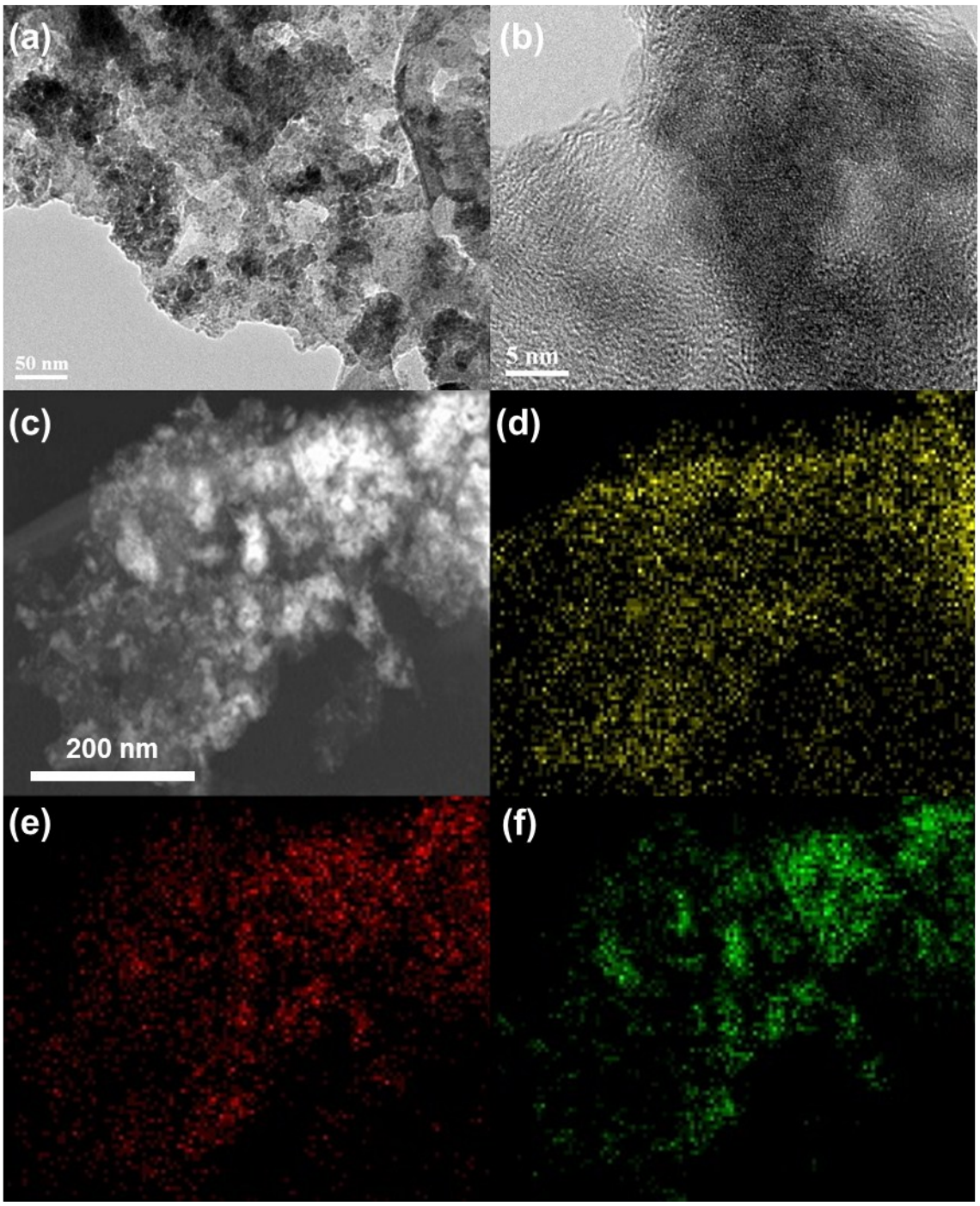

Figure S5. TEM (a), HRTEM images (b), DF-STEM image (c) and the corresponding C (d) O (e) and Fe (f) elemental maps of FeO_x-CNS-60.

Table S1. A summary of the fitted parameters of the arsenic adsorption isotherms and kinetics.

Samples	Freundlich model			Pseudo-second-order kinetic model			
As(III)	R^2	n	k ($mg^{(1-n)}\ L^n\ g^{-1}$)	R^2	k_2 ($g\ mg^{-1}\ min^{-1}$)	V_0 ($mg\ g^{-1}\ min^{-1}$)	q_{eq} ($mg\ g^{-1}$)
A-CNS	0.988	1.36	0.676				
S-CNS	0.987	1.48	1.073				
FeO_x-CNS-7	0.996	1.23	0.694				
FeO_x-CNS-13	0.992	1.06	0.414	1.000	0.0003	12.1	196
FeO_x-CNS-28	0.996	1.48	1.307				
FeO_x-CNS-60	0.998	1.63	1.780				

Samples	Freundlich model			Pseudo-second-order kinetic model			
As(V)	R^2	n	k ($mg^{(1-n)}\ L^n\ g^{-1}$)	R^2	k_2 ($g\ mg^{-1}\ min^{-1}$)	V_0 ($mg\ g^{-1}\ min^{-1}$)	q_{eq} ($mg\ g^{-1}$)
A-CNS	1.000	1.10	0.098				
S-CNS	0.999	0.96	0.048				
FeO_x-CNS-7	0.994	1.10	0.203				
FeO_x-CNS-13	0.995	0.90	0.140	1.000	0.0005	15.0	172
FeO_x-CNS-28	0.992	1.15	0.155				
FeO_x-CNS-60	0.989	1.28	0.219				

Table S2. Summary of arsenic adsorption capacity data.

Samples	q_{max} (mg g^{-1}) for As(III)	q_{max} (mg g^{-1}) for As(V)
A-CNS	104	50
S-CNS	138	63
FeO_x-CNS-7	246	93
FeO_x-CNS-13	**416**	**201**
FeO_x-CNS-28	182	61
FeO_x-CNS-60	160	50

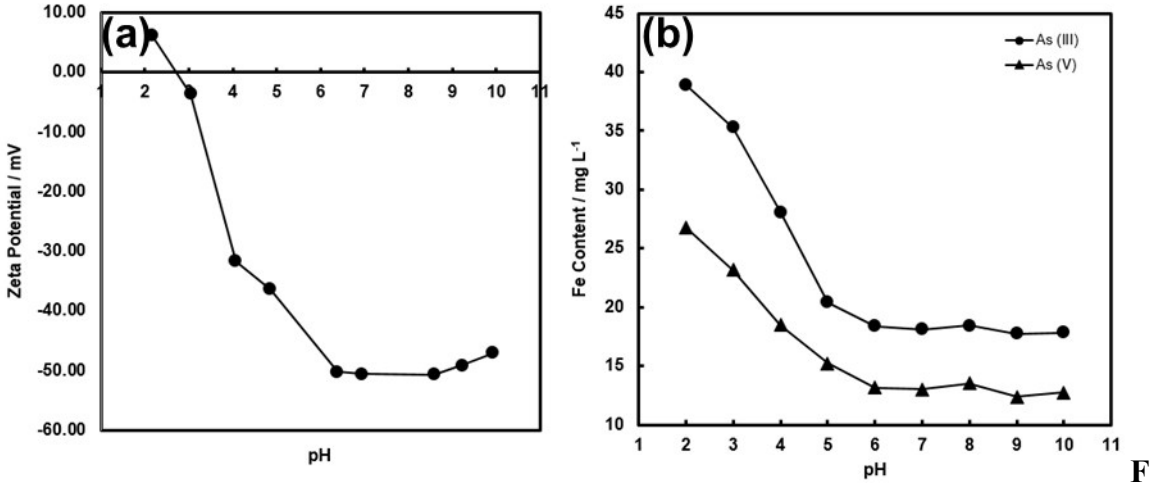

Figure S6. (a) Zeta potential of FeO_x-CNS-13 as a function of pH, and (b) the concentration of leached Fe in the equilibrium solution as a function of pH, where the initial arsenic concentration is 1,000 mg L^{-1}.