

Supplementary Information (SI) for

**Iron-activated carbon nanocomposite: synthesis, characterization
and application for lead removal from aqueous solution**

H. Sharififard,^a F. Pepe,^{b†} M. Soleimani,^a P. Aprea,^c and D. Caputo^c

^aDepartment of Chemical Engineering, Amirkabir University of Technology,
No.424, Hafez Ave., Tehran, Iran.

^bDipartimento di Ingegneria, Università del Sannio, Piazza Roma 21, 82100 Benevento, Italy.

^cDipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale,
Università Federico II, P.le Tecchio 80, 80125, Napoli, Italy.

† Corresponding author: Prof. Francesco Pepe; e-mail: francesco.pepe@unisannio.it.

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Supplementary Information with 3 Figures and 3 Tables.

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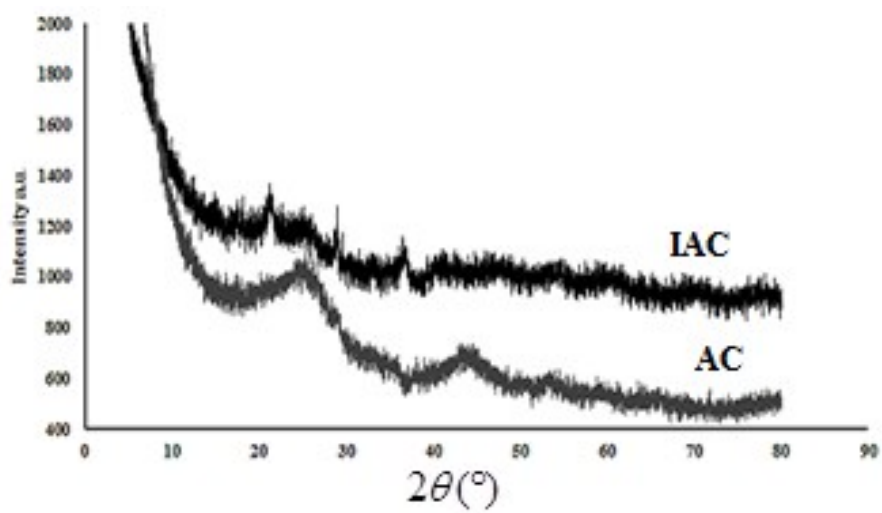


Figure S1. XRD patterns for AC and IAC nanocomposite.

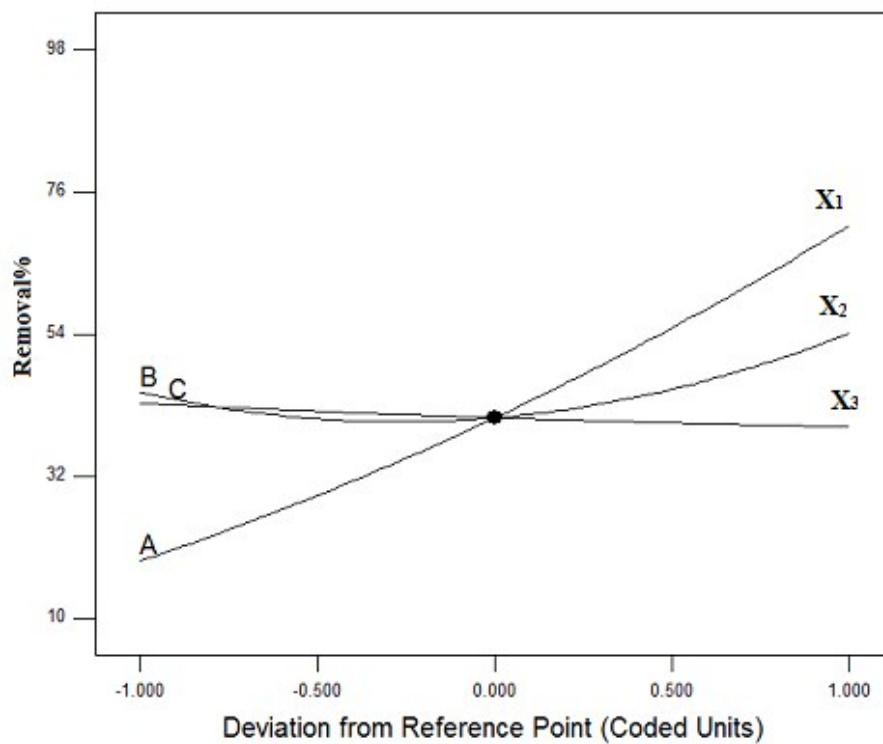


Figure S2. Perturbation plot for lead removal at central point of design parameters.
 X_1 : solution pH; X_2 : solid to liquid ratio (g L^{-1}); X_3 : initial concentration of Pb(II) (mg L^{-1}).
 Reference point: pH=4.25, solid to liquid ratio: 1.75 g L^{-1} , $C_0=60 \text{ mg L}^{-1}$.

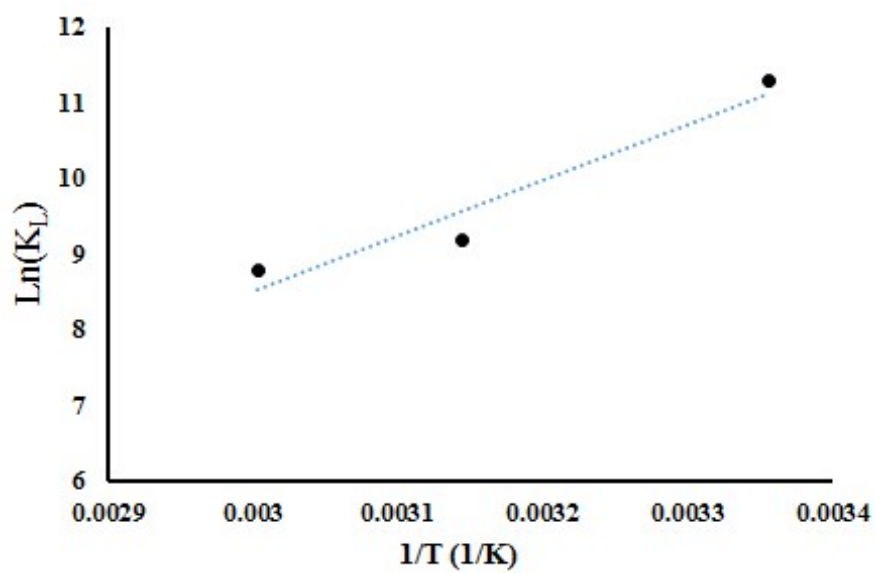


Figure S3. Relationship between $\ln(K_L)$ and $1/T$ for lead adsorption on IAC nanocomposite.

Table S1. Experimental condition and results for lead removal.

Run	pH	Solid to Liquid Ratio (g L ⁻¹)	Initial Concentration (mg L ⁻¹)	Removal %
1	4.25	1.75	60	42.59
2	4.25	1.75	115	35.6
3	6.72	1.75	60	72.85
4	4.25	0.38	60	45
5	4.25	1.75	5	46.5
6	4.25	1.75	60	40.51
7	1.77	1.75	60	17.46
8	6.5	0.5	110	69.41
9	4.25	1.75	60	40.78
10	2	3	10	21.87
11	4.25	1.75	60	41.41
12	6.5	0.5	10	88.76
13	4.25	1.75	60	41.41
14	2	3	110	49.18
15	6.5	3	10	98
16	4.25	1.75	60	41.41
17	6.5	3	110	66
18	4.25	3.13	60	56.6
19	2	0.5	10	10.4
20	2	0.5	110	29.55

Table S2. Constants and regression coefficients for kinetic models.

Model	Parameter	Value
Pseudo-first-order	$q_{e,exp}$ (mg g ⁻¹)	72.36
	k_1 (min ⁻¹)	0.0092
	q_e (mg g ⁻¹)	26.67
	R^2	0.788
Pseudo-second-order	k_2 (g mg ⁻¹ .min ⁻¹)	0.0024
	q_e (mg g ⁻¹)	71.42
	R^2	0.99
Intra-particle diffusion	k_{id} (mg g ⁻¹ .min ^{-1/2})	2.0539
	Inters	41.11
	R^2	0.95
Boyd	B	0.027
	Inters	1.28
	R^2	0.972

Table S3. Thermodynamic parameters for lead removal on IAC nanocomposite.

Temp. (°C)	ΔG° (kJ mol ⁻¹)	ΔH° (kJ mol ⁻¹)	$T \cdot \Delta S^\circ$ (kJ mol ⁻¹)	ΔS° (kJ mol ⁻¹ K ⁻¹)	R^2
25	-27.979		-33.614		
45	-24.282	-61.208	-35.870	-0.112	0.957
60	-24.2916		-37.562		