Supplementary information for

Bio-functionalized Magnetic Nanoparticles for Cost-effective Adsorption of U(VI): Experimental and Theoretical Investigation

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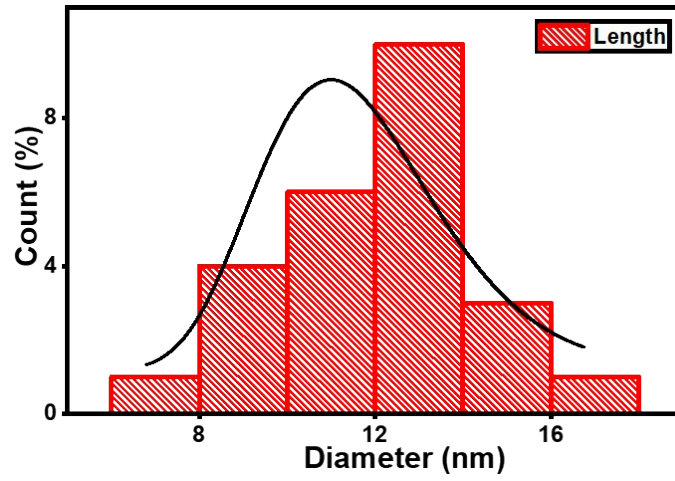*Phone : +91-22-2559 2349, Fax: +91-22-2550 5313*

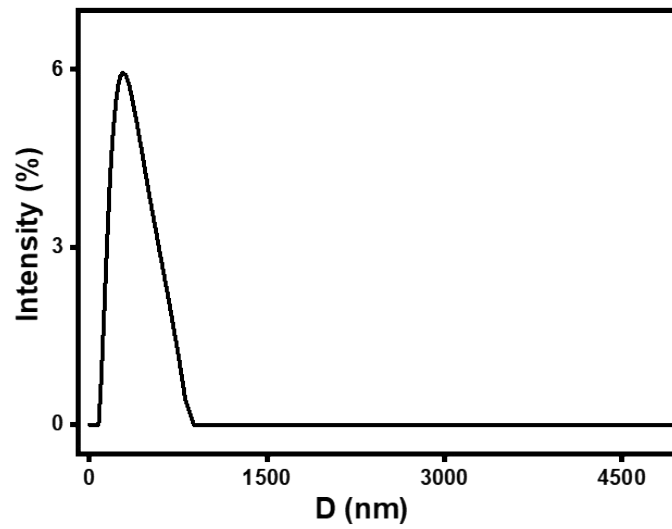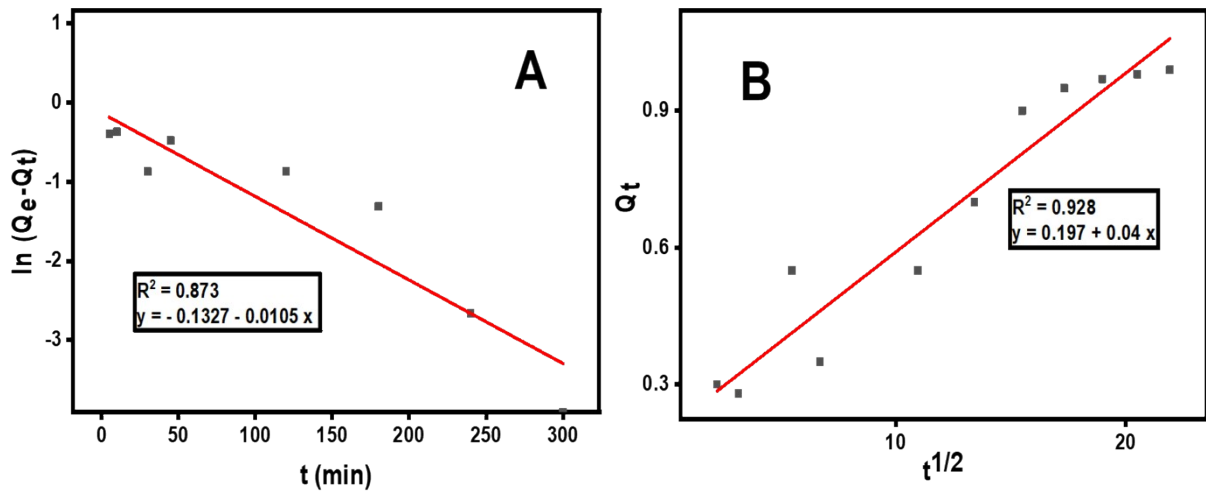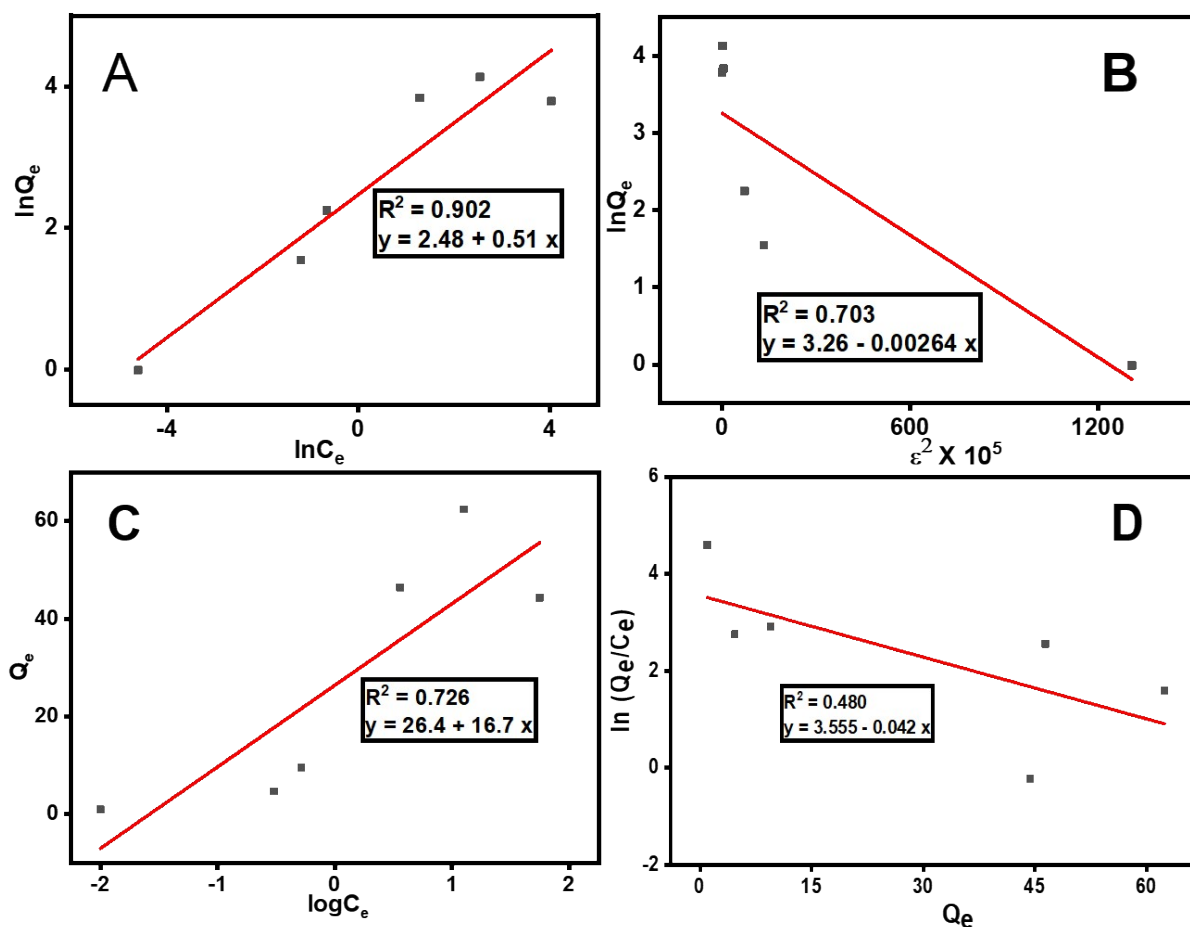**Figure S1**: A histogram of size analysis from HRTEM image

Figure S2: DLS analyzed hydrodynamic size of synthesized CT@MNPs

$R^2 = 0.873$
$y = -0.1327 - 0.0105\ x$

$R^2 = 0.928$
$y = 0.197 + 0.04\ x$

Figure S3: A. Pseudo-first-order kinetic model and B. Intraparticle diffusion model of the U(VI) adsorption onto CT@MNPs.

Figure S4: A. Freundlich, B. D-R, C. Temkin and D. Elovich isotherm model of adsorption of U(VI) onto CT@MNPs

Table S1

Various kinetic parameters for the adsorption of U(VI) onto CT@MNPs.

Adsorbate	Concentration (mg L^{-1})	Order	Q_e (exp) (mg g^{-1})	Q_e (cal) (mg g^{-1})	Rate constant*	R^2
		Pseudo-first		83.4	0.0105	0.873
U(VI)	1.0	Pseudo-second	0.97	1.09	0.0160	0.964
		Intraparticle		NA*	0.0400	0.928

	diffusion

* Units for pseudo-first, pseudo-second order and intraparticle diffusion rate constants are min^{-1}, g mg^{-1} min^{-1} and mg g^{-1} min$^{-1/2}$, respectively; * NA = Not applicable.

Table S2

Various isotherm parameters for the adsorption of U(VI) onto CT@MNPs

Langmuir isotherm	
K_L (L mg^{-1})	2.095
R_L	0.323
Q_{max} (mg g^{-1})	45.45
R^2	0.990
Freundlich isotherm	
K_F (mg g^{-1})	11.94
$1/n$ (mg L^{-1})	0.51
R^2	0.902
Dubinin-Radushkevich (D-R) isotherm	
β	0.003
E (kJ mol^{-1})	13.76
Q_{max} (mg g^{-1})	25.05
R^2	0.703
Temkin isotherm	
K_T (L g^{-1})	38.09
B (J mol^{-1})	341.67
R^2	0.726
Elovich isotherm	
K_E	1.47
Q_{max}	23.81
R^2	0.480

A comparison table regarding the maximum adsorption capacity is given (Table 3), which tells us that the CT@MNPs was much efficient towards the removal of U(VI).

Table S3

Production cost of CT@MNPs per kg, to use in wastewater purification.

Raw materials	Cost* (USD)	Quantity	Price (US$)
Chemicals			
$FeCl_2$, powder	0.39/kg	0.50 kg	0.19
$FeCl_3$ (anhydrous)	0.24/kg	1.29 kg	0.31
NaOH	0.26/kg	1.28 kg	0.33
Water	0.06/L	100 L	6.00
Cinnamomum tamala leaf	0/kg	5.71 kg	0
Others			
Labor	5.20/employee**	1 day	5.20
Electricity	0.07/kWh	20 kWh	1.40
Maintenance and insurance			0.60
Total			**14.03**

* Price of water and other reagents is based on: IndiaMART (https://www.indiamart.com); **

Employee salary (per day), according to government order: https://wblc.gov.in/synopsys/July/2022.