

Supporting Information

Biomass-based water purification: A simple and novel one-pot process for converting date palm mesh fibers into a valuable nanomagnetic composite for water treatment.

Legends of Figures

Fig. S1. EDS elemental mapping of MDPMF.

Fig. S2. The nitrogen adsorption–desorption isotherm of (A) synthesized Fe_3O_4 , (B) treated DPMF, and (C) MDPMF. The insets show their corresponding pore size distribution obtained from BJH.

Fig. S3. TGA of treated DPMF and MDPMF.

Fig. S4. The point of the zero charge of the synthesized MDPMF nanocomposite determined by drift method.

Fig. S5. The (A) FESEM, (B) XRD, and (C) FT-IR of the MDPMF after adsorption and desorption of MB.

Fig. S6. Effect of temperature on the adsorption of (A) MB and (B) MnO_4^- ions by MDPMF nanocomposite.

Fig. S7. (A) Langmuir isotherm model, (B) Freundlich isotherm model, and (C) Temkin isotherm model of MDPMF nanocomposite for MB and MnO_4^- .

Fig. S8. The pseudo-first order model of MDPMF nanocomposite for (A) MB and (B) MnO_4^- .

Fig. S9. The pseudo-second order model of MDPMF nanocomposite for (A) MB and (B) MnO_4^- .

Fig. S10. The intra-particle diffusion model of MDPMF nanocomposite for (A) MB and (B) MnO_4^- .

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Tables S1. Cost estimation of MDPMF synthesis

Raw material cost	No.	Material	Price	Usage amount	Final price
	1	Distilled water	0.2 EUR/L	200 mL	0.04 EUR
	2	Date palm mesh fibers	Agriculture waste (free)	-	-
	3	Iron (II) sulfate heptahydrate	0.11 EUR/g	2.8 g	0.31 EUR
	4	Sodium hypochlorite solution	4.3 EUR/L	10 mL	0.043 EUR
	5	Sodium hydroxide pellets	0.08 EUR/g	1.2 g	0.096 EUR
	6	Ammonia solution (25%)	157.2 EUR/L	1 mL	0.157 EUR
Process steps		Process	Time	Iran electricity prices EUR/ kWh	Price(EUR)
	1	Drying in an oven	60 h	0.003	0.180
	2	Heating by heater stirrer	40 min	0.003	0.002
Sum					0.828 EUR
0.828 EUR/g MDPMF					

Table S2. Batch adsorption experimental conditions.

Analyte	Parameters	Fe loading (M)	Dosage of MDPMF (mg/mL)	pH	Initial concentration of analyte (mg/L)	Temperature (°C)
MB	Effect of Fe loading	0-0.3	0.50	Non-adjusted	4.0	25
	Effect of dosage of MDPMF (mg/mL)	0.1	0.25-1.00	Non-adjusted	4.0	25
	Effect of pH	0.1	0.75	3.0-11.0	4.0	25
	Effect of initial concentration (mg/L)	0.1	0.75	11.0	2.0-10.0	25
	Effect of temperature (°C)	0.1	0.75	11.0	4.0	25-70
MnO₄⁻	Effect of pH	0.1	1.25	2.0-10.0	80.0	25
	Effect of dosage of MDPMF (mg/mL)	0.1	0.75-2.50	7.0	80.0	25
	Effect of initial concentration (mg/L)	0.1	2.50	7.0	60.0-160.0	25
	Effect of temperature (°C)	0.1	2.50	7.0	80.0	25-55

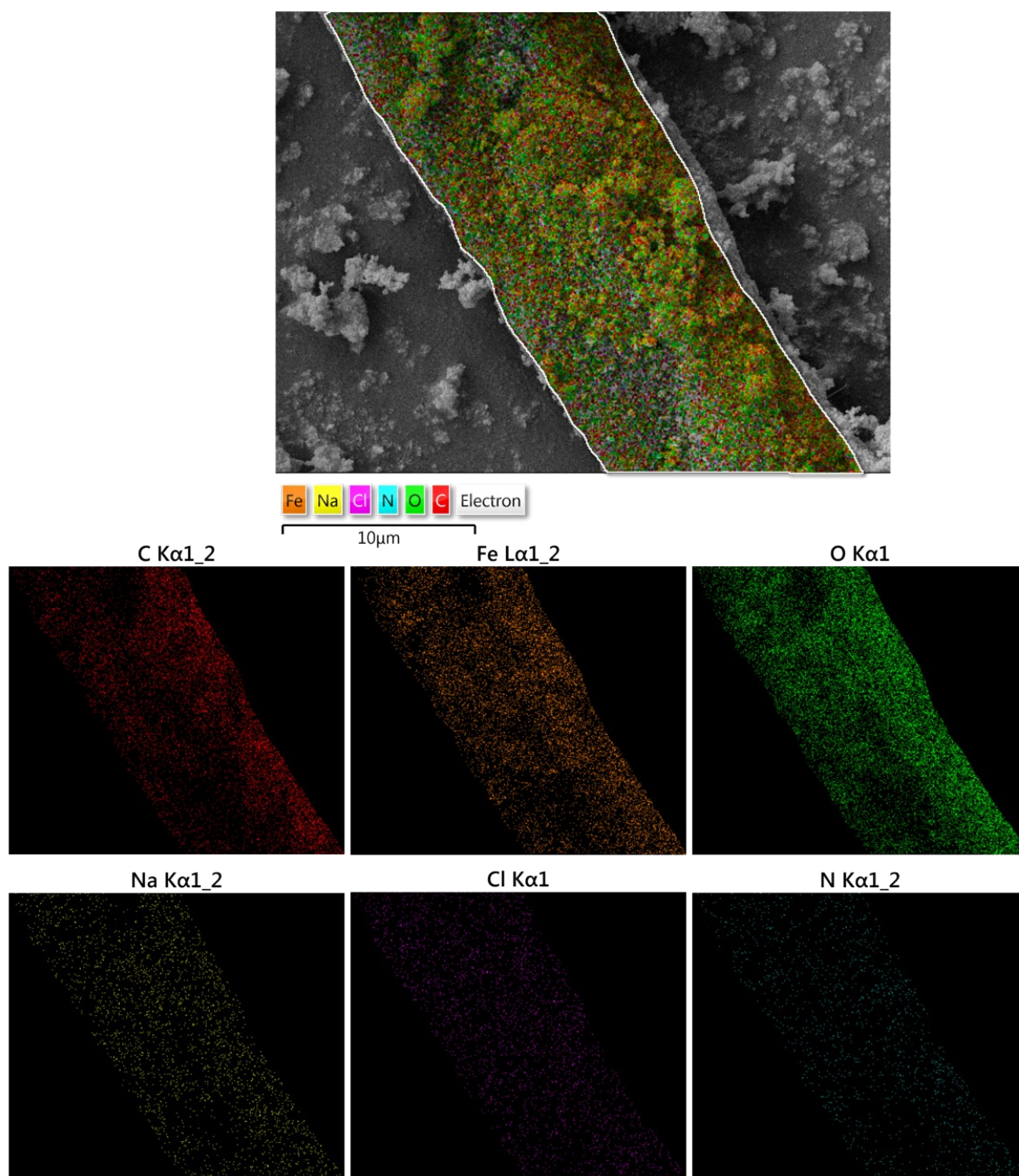


Fig. S1

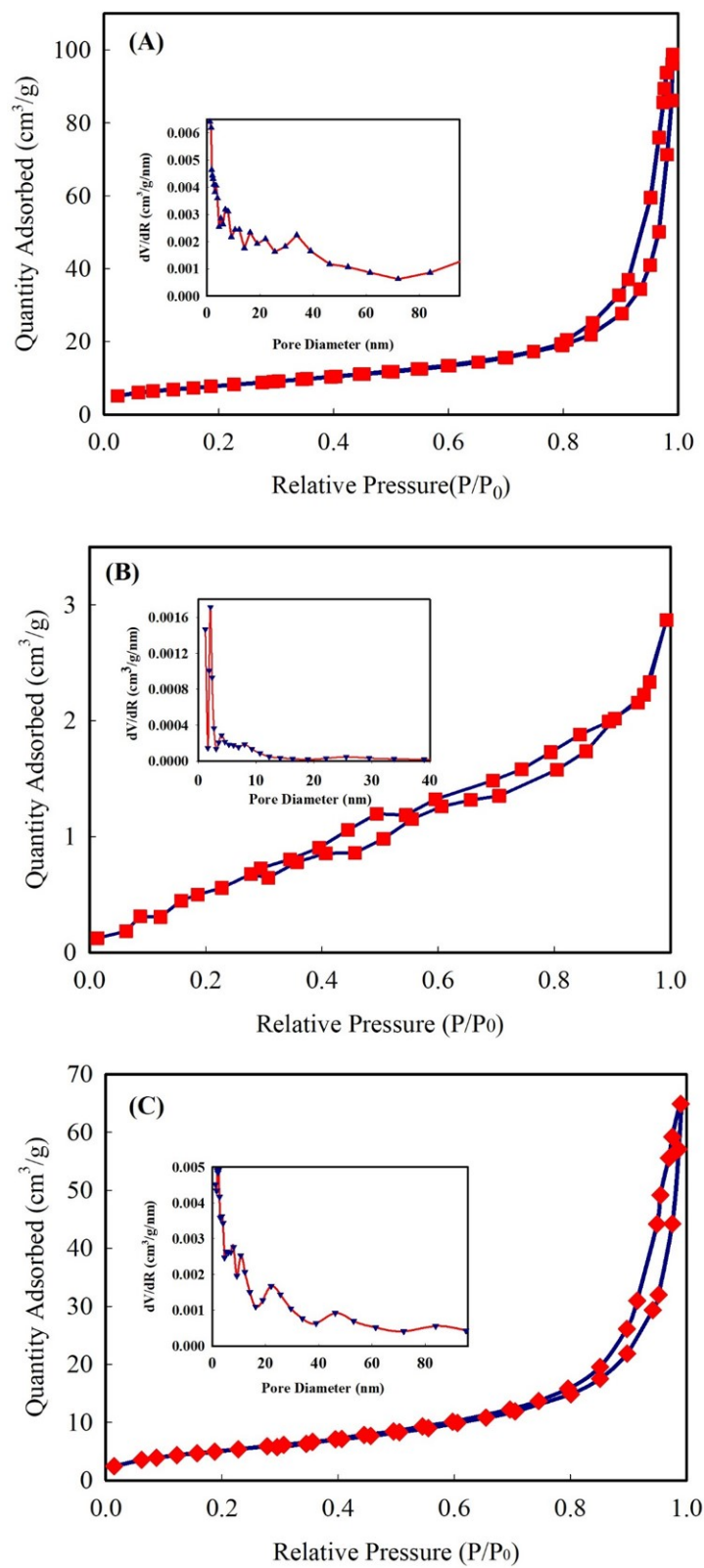


Fig. S2

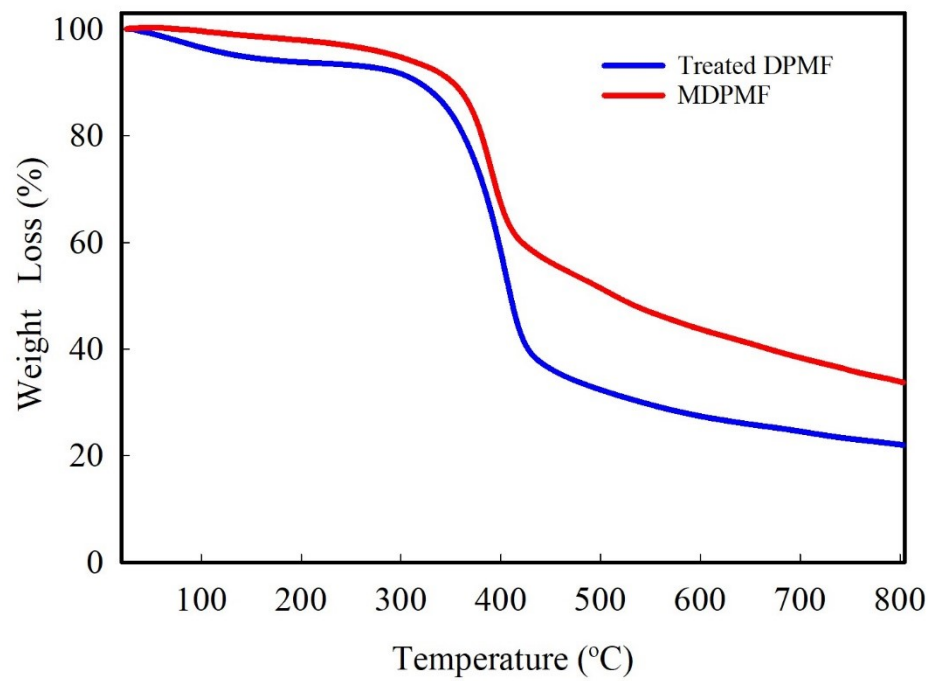


Fig. S3

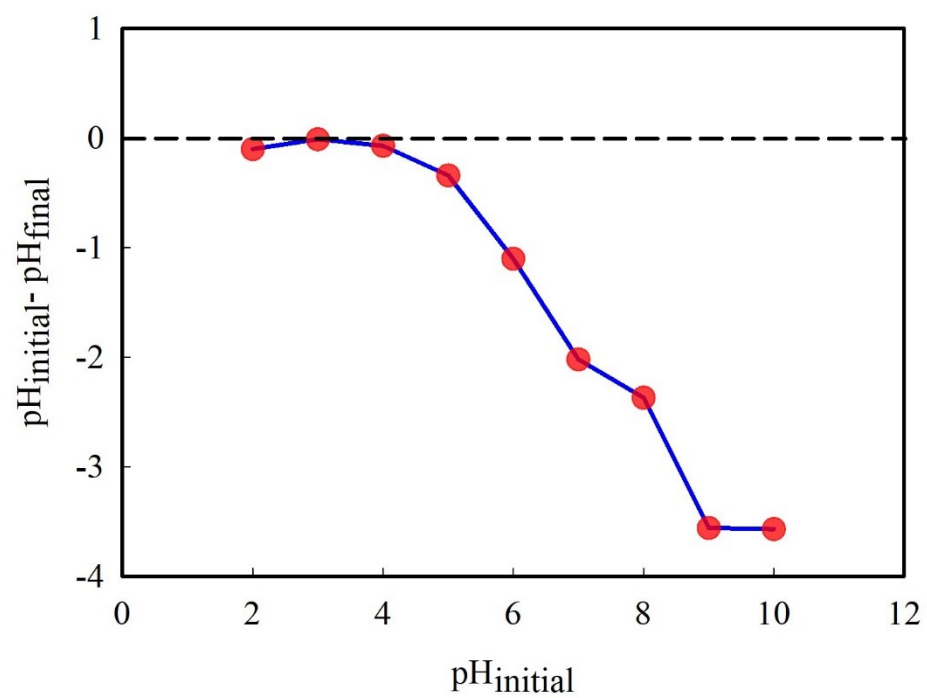


Fig. S4

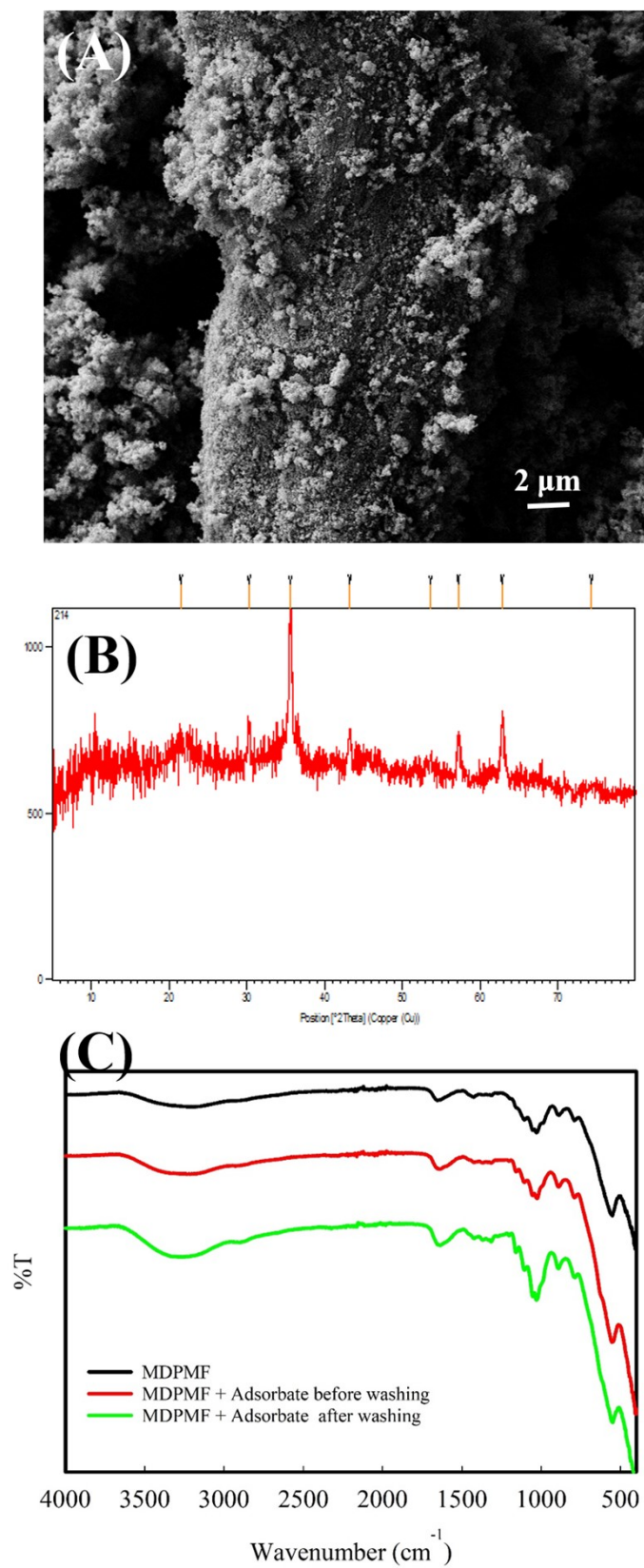


Fig. S5

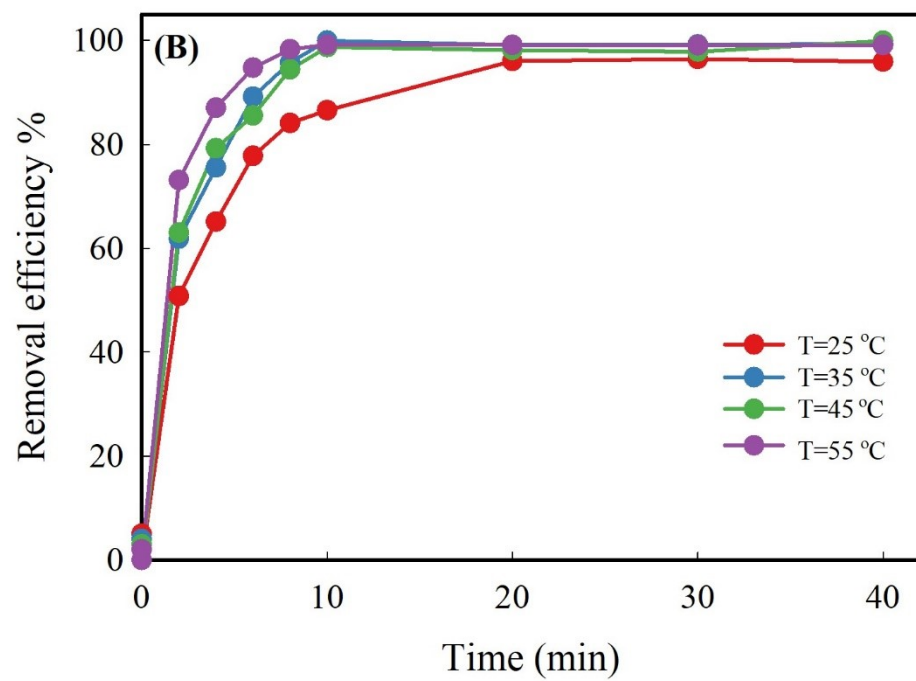
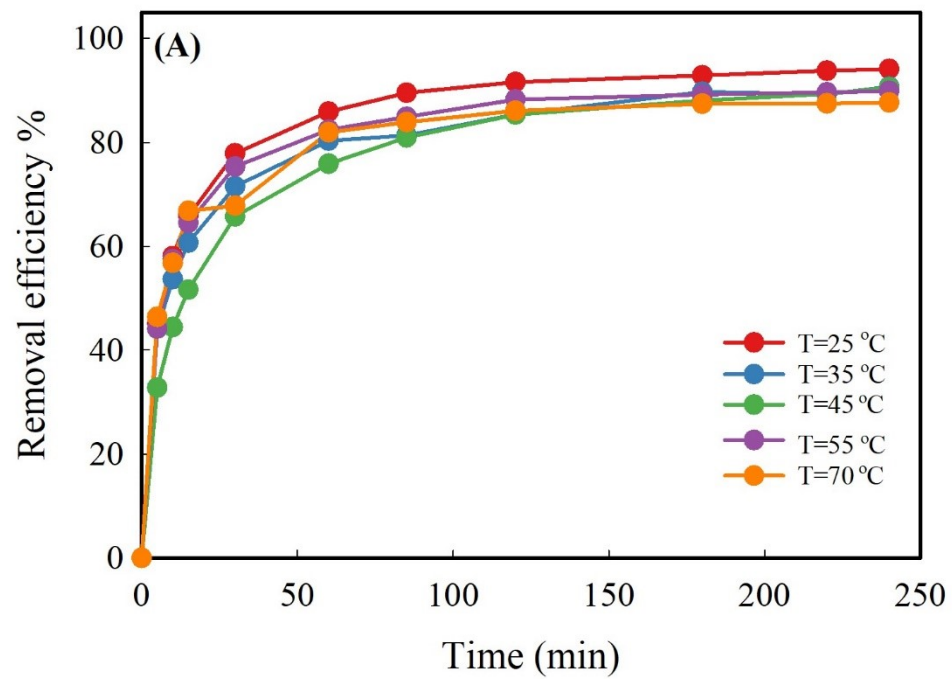


Fig. S6

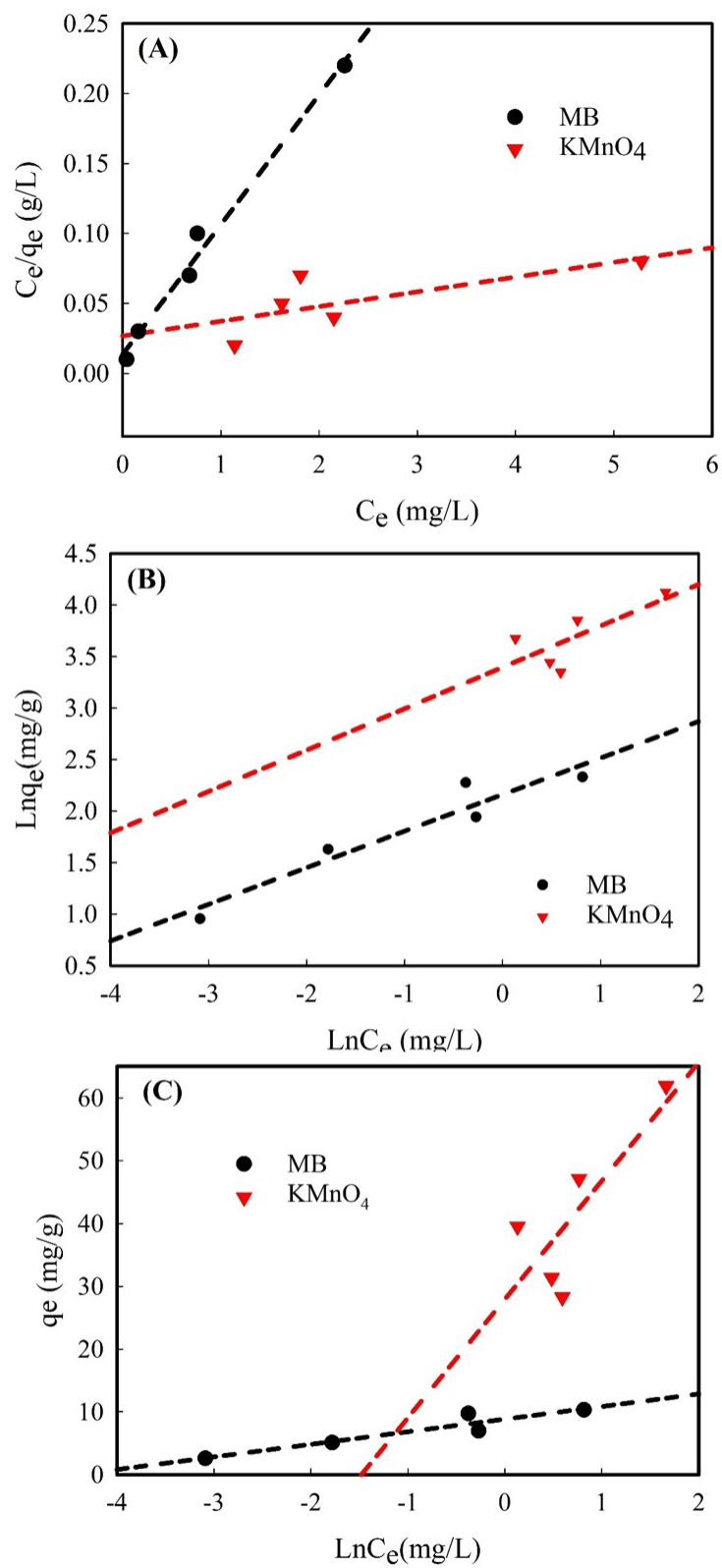


Fig. S7

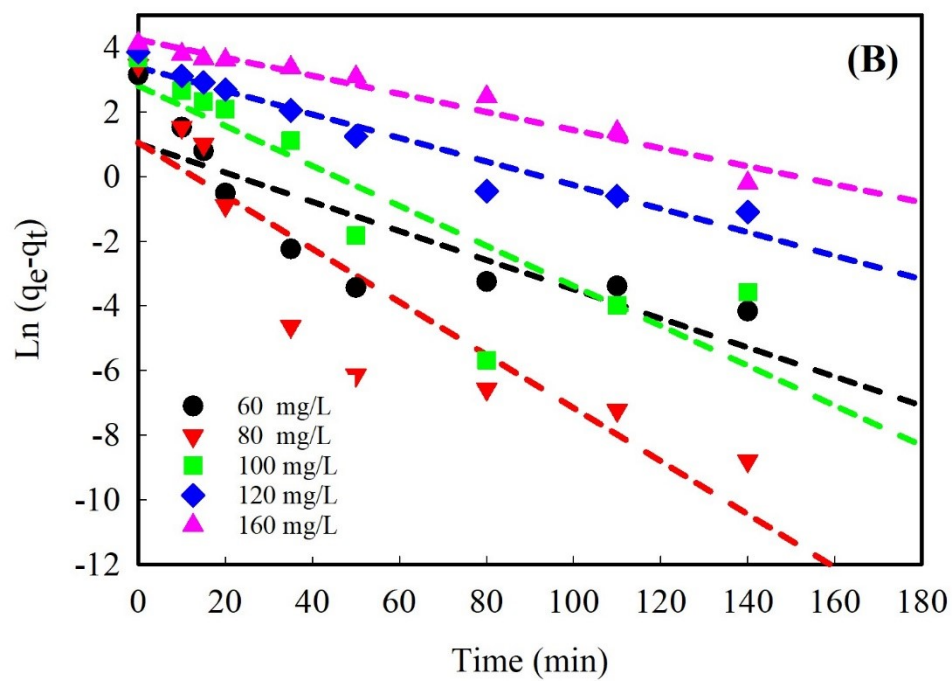
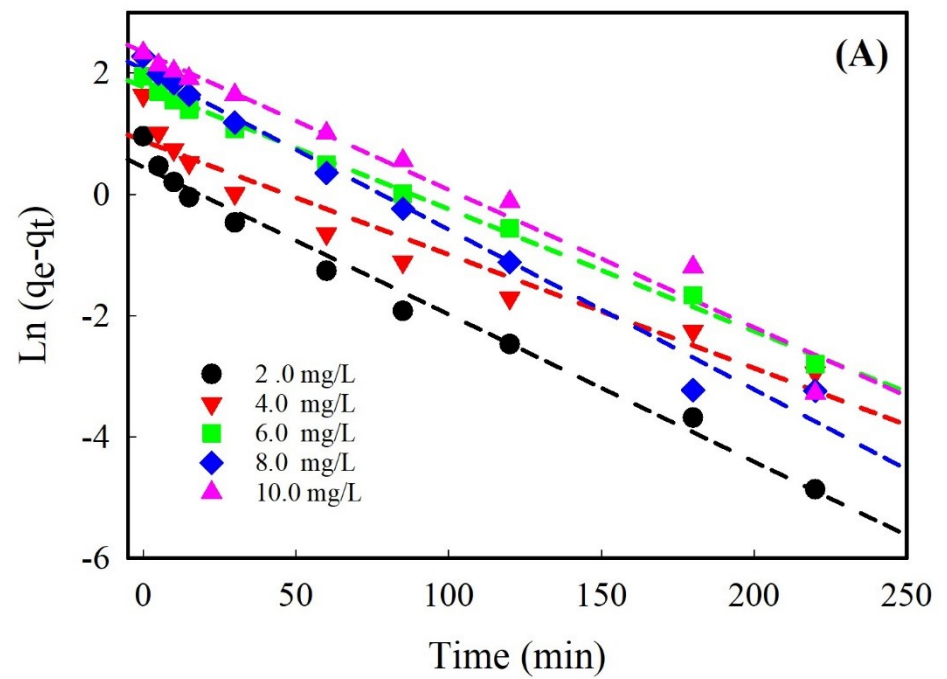


Fig. S8

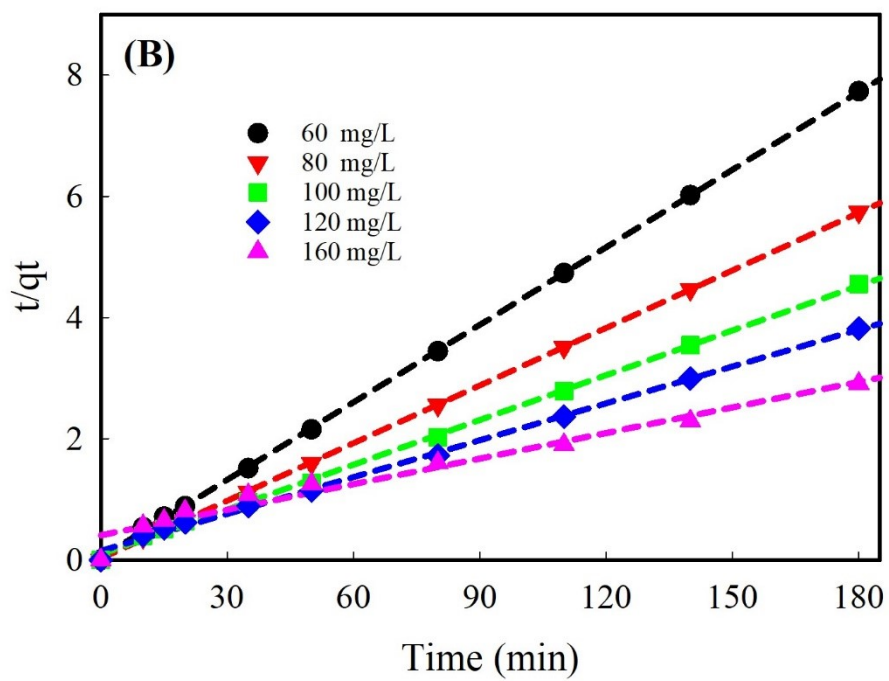
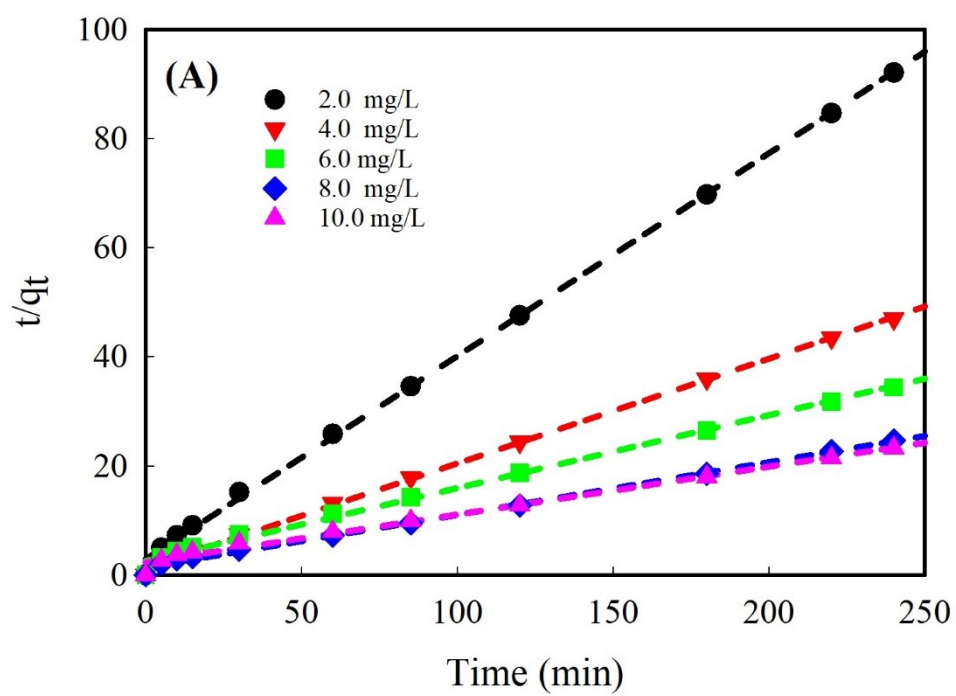


Fig. S9

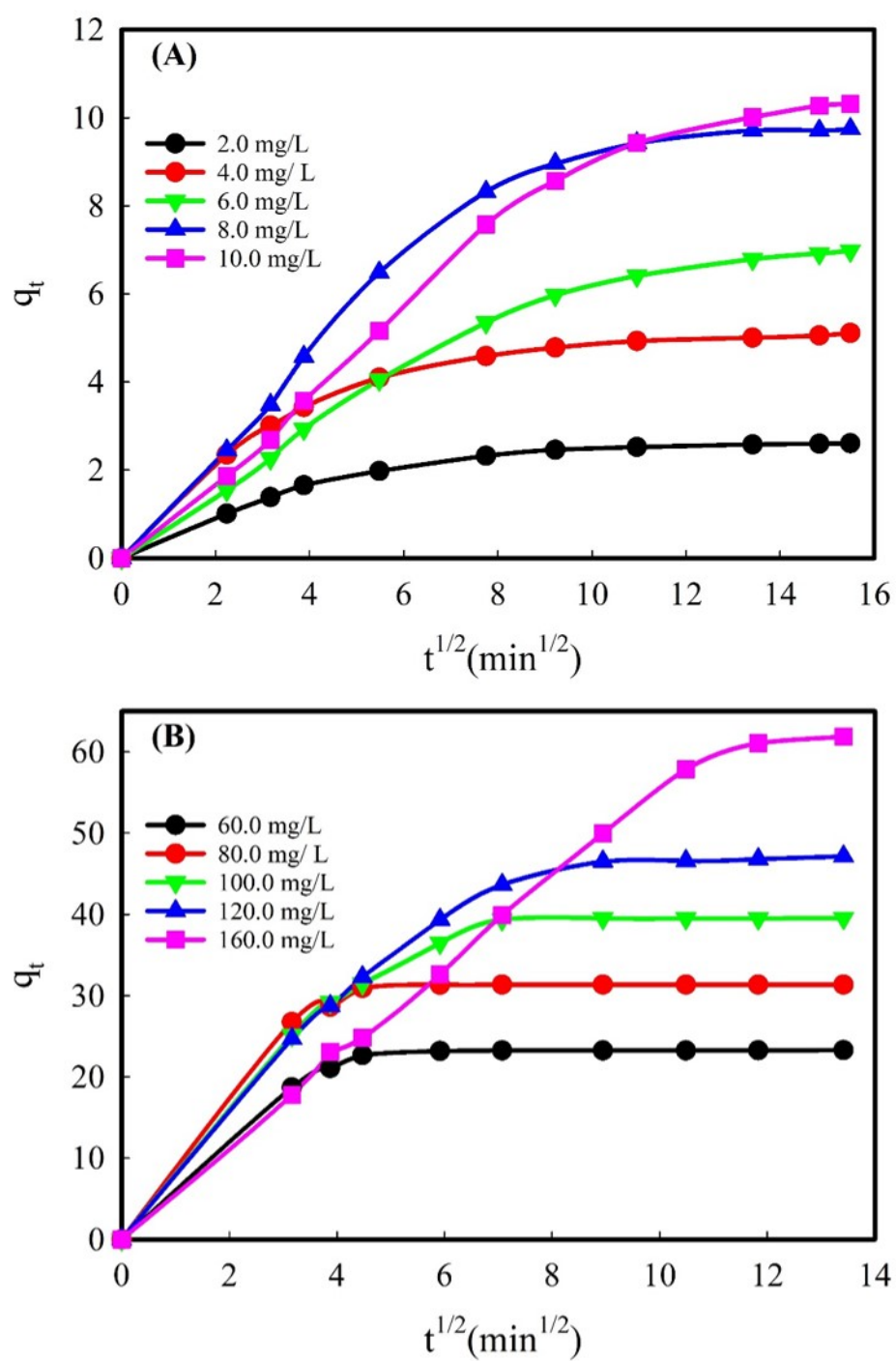


Fig. S10