

**Revolutionary dual nanofillers embedded nanofiltration membranes: fabricated CQDs and PMO-PPD modified membranes for experimental design optimization of simultaneous removal of Pb(II), MO, and NaCl from wastewater**

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**Table S1.** The list of chemicals used in this study.

Chemical	Mw (g/mol)	Supplier
Polyethersulfone (PES)	58000	BASF, Germany
Polyvinylpyrrolidone (PVP)	29000	Merck, Germany
Dimethylacetamide (DMAc)	87.12	Merck, Germany
Bovine serum albumin (BSA)	66430.3	Merck, Germany
P-123 surfactant	5800	Merck, Germany
Bis(triethoxysilyl)ethane (BTESE)	-	Merck, Germany
P-phenylenediamine (PPD)	108.14	Merck, Germany
Toluene (C <sub>7</sub> H <sub>8</sub> )	92.141	Merck, Germany
Triethoxyvinylsilane (TEVS)	190.31	Merck, Germany
Acetonitrile (C <sub>2</sub> H <sub>3</sub> N)	41.05	Merck, Germany
Ethanol's (C <sub>2</sub> H <sub>5</sub> OH)	46.07	Merck, Germany
Hydrochloric acid (HCl)	36.46	Merck, Germany
Bromine (Br)	79.904	Merck, Germany
Sodium hydroxide (NaOH)	39.997	Merck, Germany
lead(II) nitrate (Pb(NO <sub>3</sub> ) <sub>2</sub> )	331.21	Merck, Germany
Citrate acid (C <sub>6</sub> H <sub>8</sub> O <sub>7</sub> )	192.10	Merck, Germany
Sodium chloride (NaCl)	58.44	Merck, Germany
Methyl orange (MO)	327.34	Sigma-Aldrich, UK

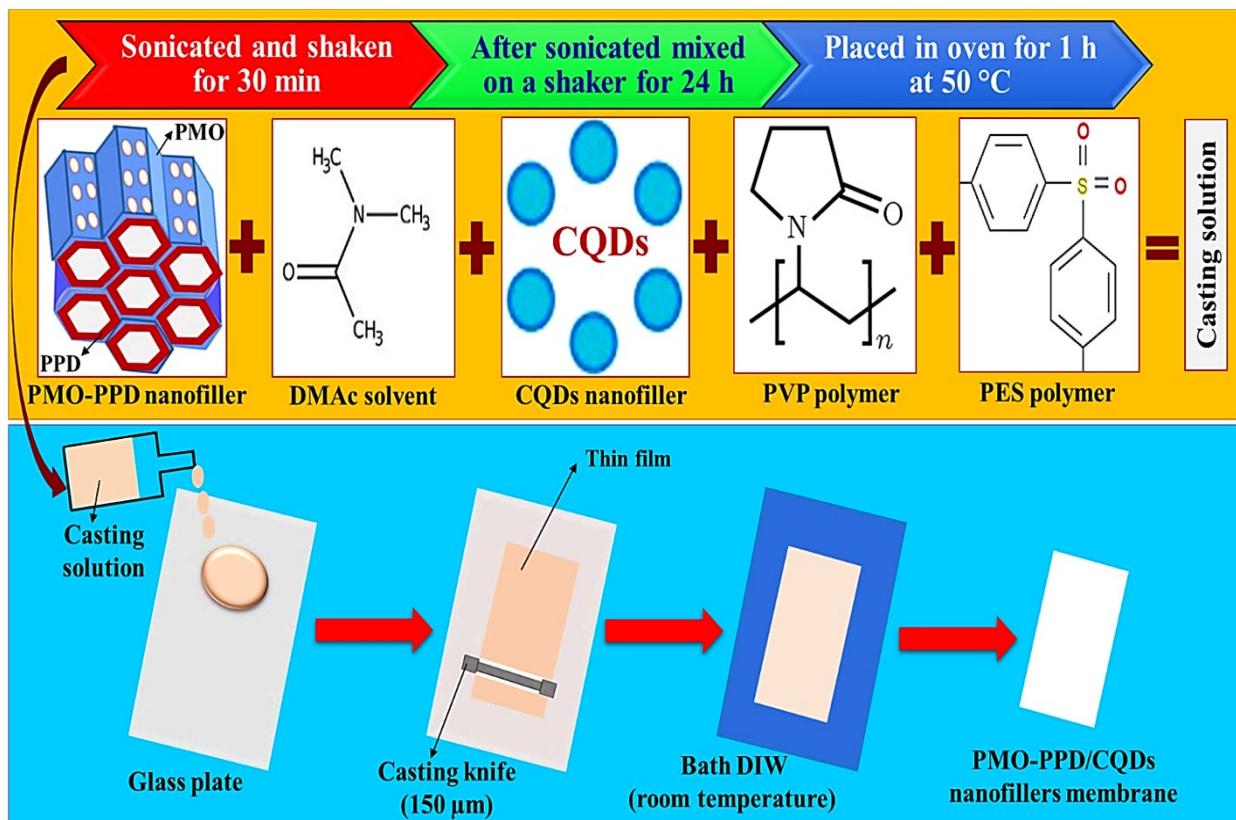


Fig. S1. Schematic of fabrication of the membrane NF using PMO-PPD/CQDs nanofillers

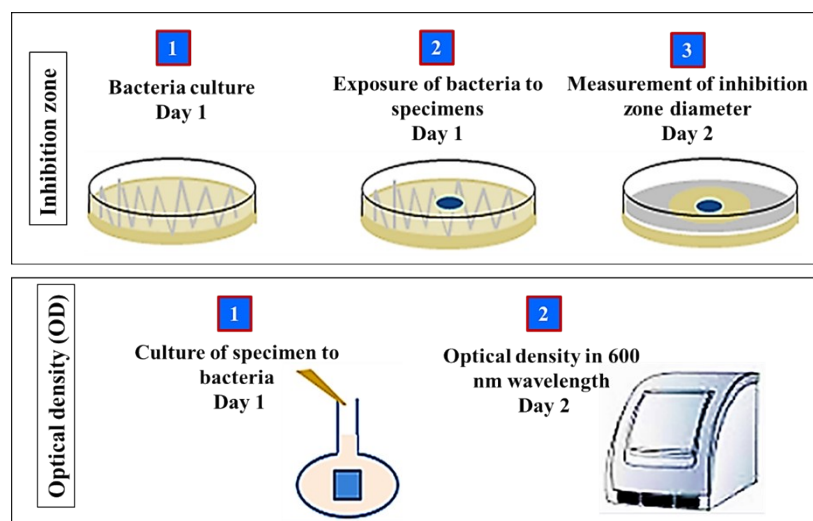
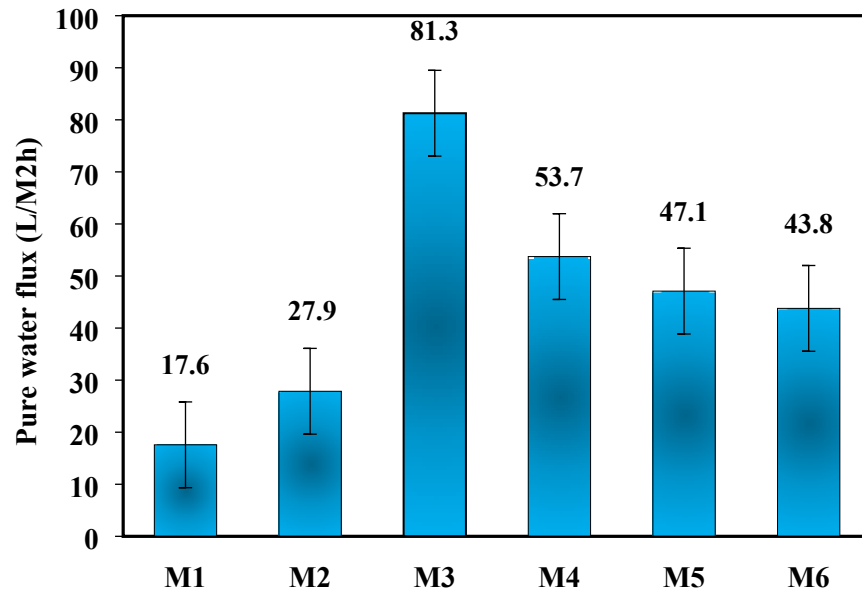


Fig. S2. A schematic of antibacterial test methods.



**Fig. S3.** The pure water flux of fabricated membranes.

**Table S2.** The contact angle and porosity of fabricated membranes.

Membrane code	Contact angle (°)	Mean of pore size (nm)	Overall porosity (%)
M1	63.00	3.68	66.70±2.80
M2	59.90	4.33	69.60±2.60
M3	46.60	5.91	83.90±2.80
M4	49.40	5.20	79.90±2.50
M5	53.20	5.13	76.30±2.60
M6	56.40	5.05	74.00±2.30

**Table S3.** Statistical parameters gathered from the ANOVA analysis for the selected models.

Response	Model	R <sup>2</sup>	Adj. R <sup>2</sup>	SD	CV%
Pb(II) removal%	Quartic	0.9995	0.9994	0.071	0.14
MO removal%	Cubic	0.9404	0.8113	0.34	4.28
NaCl removal%	Quartic	0.9996	0.9997	0.005	0.11