Supplementary Information

Ultrahigh-flux and fouling-resistant membrane based on layered silver/MXene($Ti_3C_2T_x$) nanosheets†

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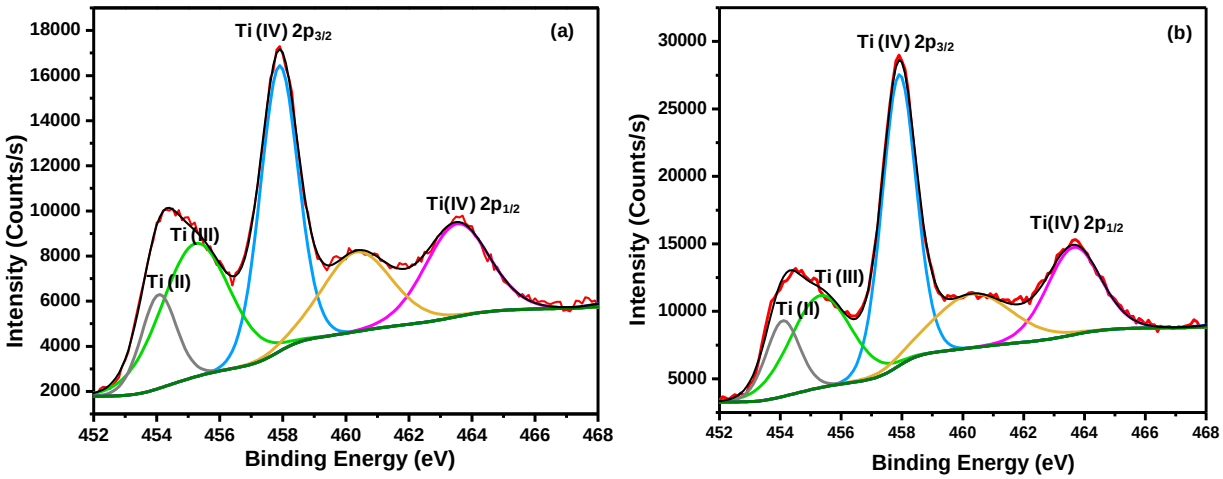

Fig. S1 Ti 2p core level XPS spectra from (a) 7%Ag@MXene and (b) 14%Ag@MXene.

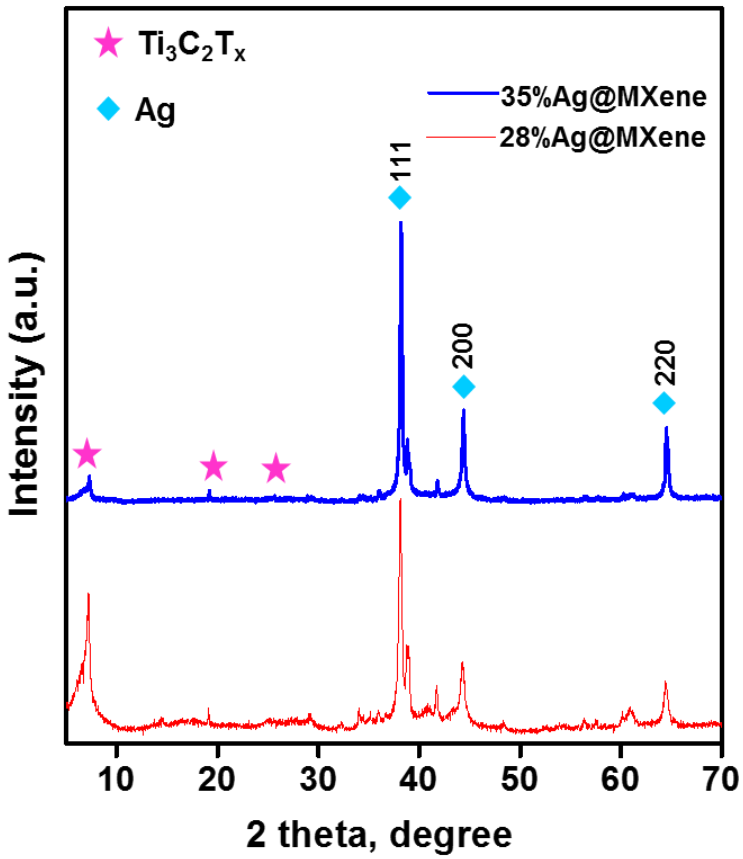

Fig. S2 XRD patterns of 28%Ag@MXene and 35%Ag@MXene membranes.

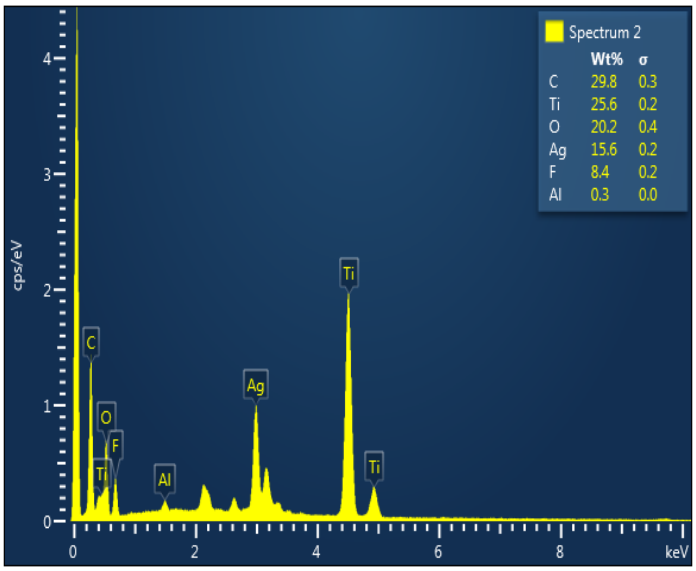

Fig. S3 EDS spectrum from 21%Ag@MXene composite membrane showing presence of Ag on MXene.

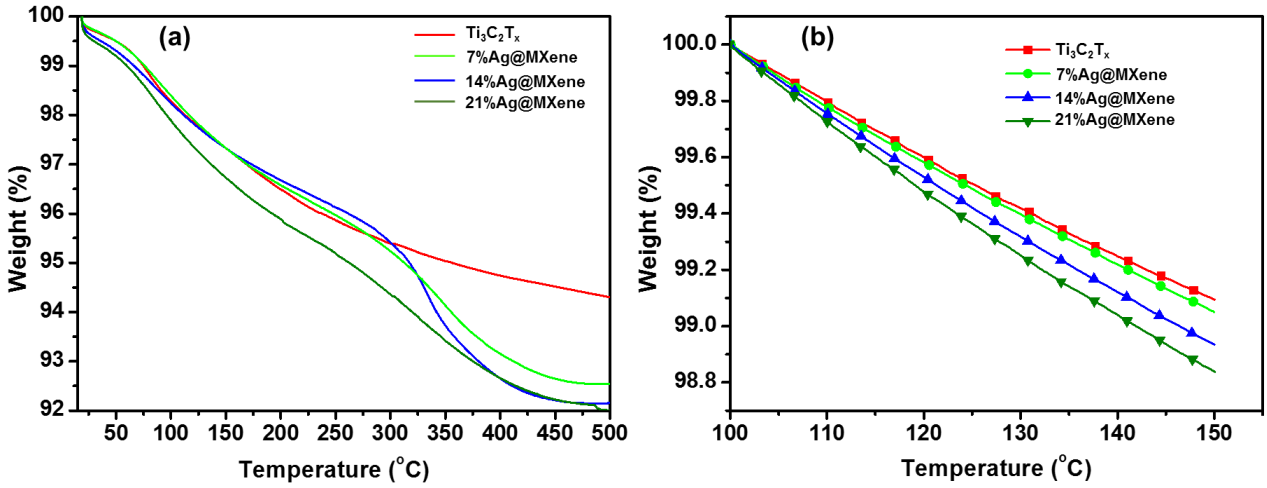

Fig. S4 (a) TGA curves for pristine $Ti_3C_2T_x$, and Ag@MXene composite membranes, (b) TGA thermograms for the estimation of bound water.

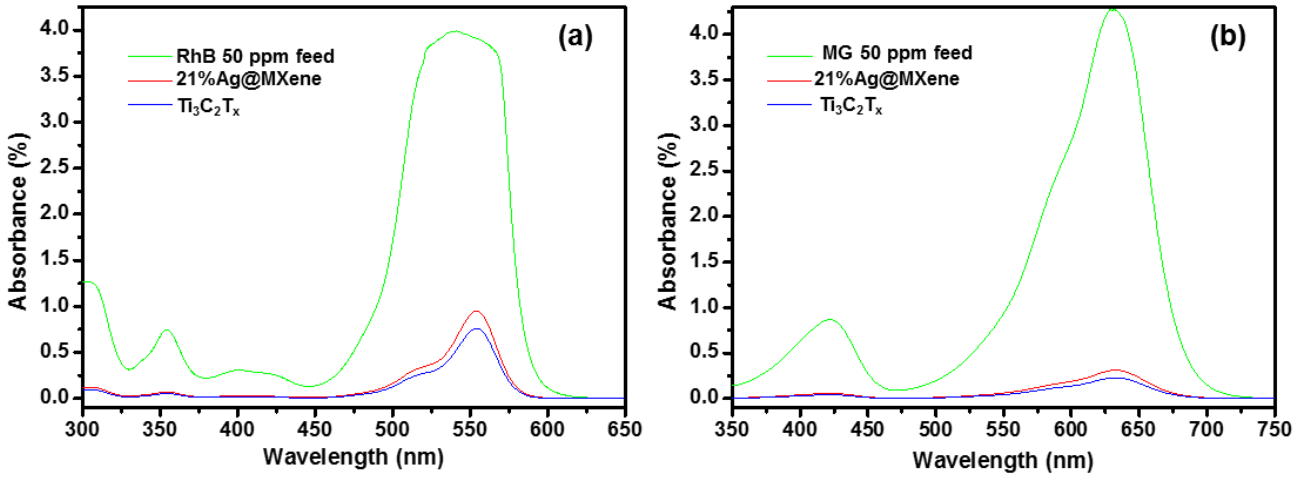

Fig. S5 RhB and MG rejection performance of $Ti_3C_2T_x$ and Ag@MXene membranes: UV-vis absorbance spectra for (a) RhB and (b) MG.

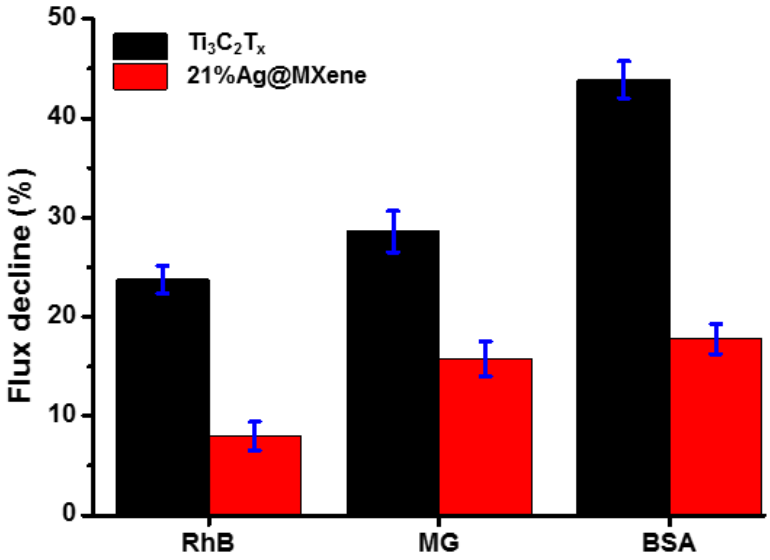

Fig. S6 Comparison of flux decline of the MXene ($Ti_3C_2T_x$) and 21%Ag@MXene membranes for the separation of RhB, MG and BSA molecules at 25 °C.

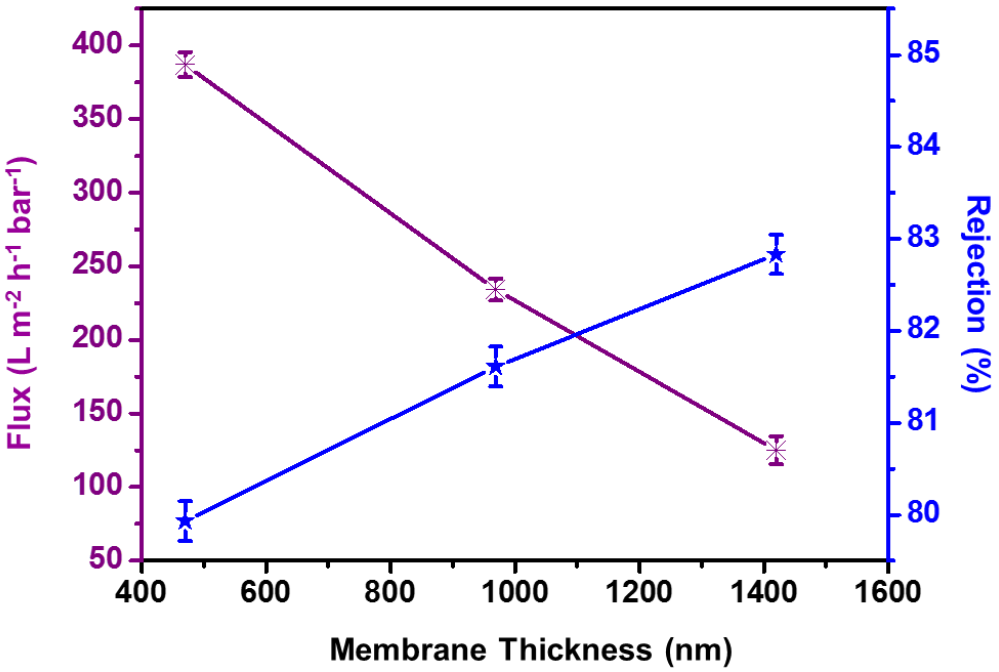

Fig. S7 Effect of membrane thickness on separation performance of 21%Ag@MXene composite membrane. (RhB was used for separation study).

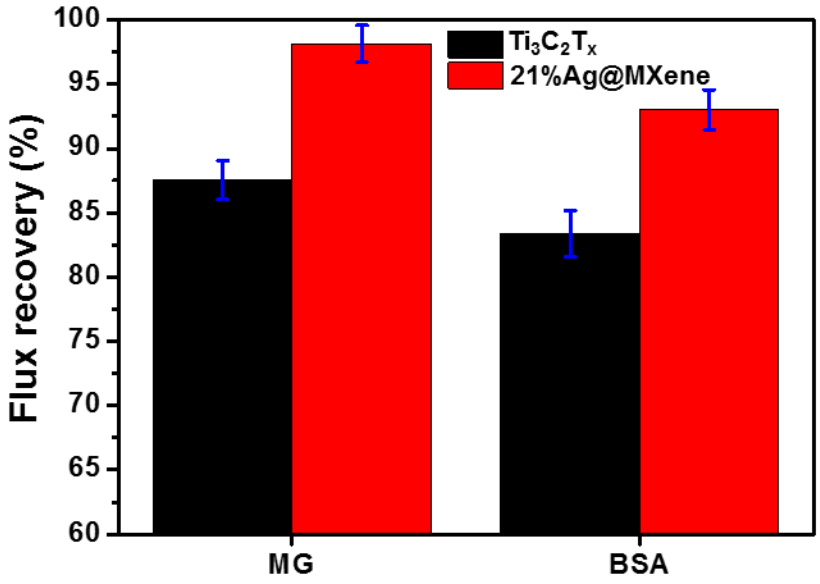

Fig. S8 Comparison of flux recovery after organic fouling in MXene ($Ti_3C_2T_x$) and 21%Ag@MXene membranes (Feed: 300 mg/L, volume 2000 mL).

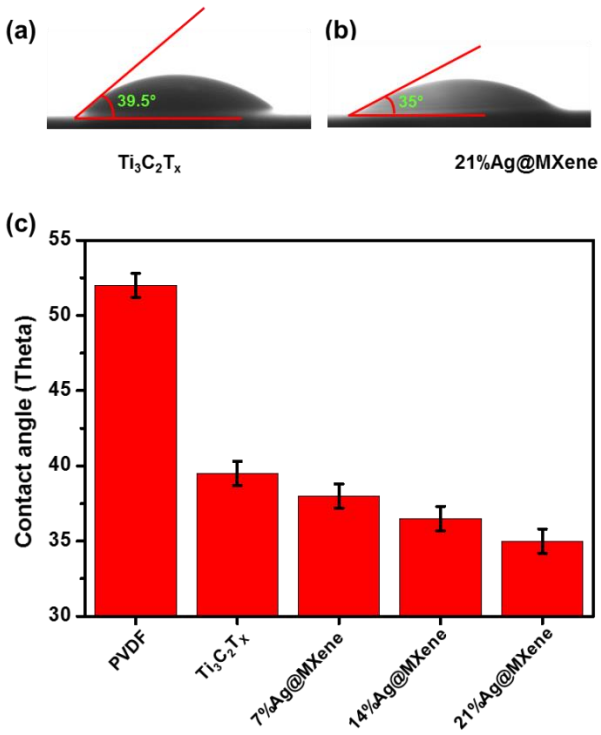

Fig. S9 Water contact angle of prepared Ag@MXene membranes: (a & b) digital image showing contact angle of a water droplet on $Ti_3C_2T_x$ and 21%Ag@MXene membranes, and (c) contact angle data with varied silver content.

Molecule or Ion	MW (g mol^{-1})	Size (nm)	Rejection (%) by membranes		Membranes Pore diameter (nm)	
			$Ti_3C_2T_x$	21%Ag@MXene	MXene	21%Ag@MXene
$Na^{+}_{(aq)}$	58.44	0.716 (diameter)	29.24	25.84	2.22	2.39
$Mg^{2+}_{(aq)}$	95.21	0.856 (diameter)	44.07	41.36	2.03	2.13
$Al^{3+}_{(aq)}$	133.34	0.950 (diameter)	53.51	49.54	1.97	2.08
RhB	479.01	1.44×1.09×0.64	81.04	79.93	1.78	1.81
MG	653.24	-	94.09	92.32	-	-
BSA	67000	-	100	100	-	-

Table S1 Solute rejection data for different ions and molecules.