Electronic Supplementary Information (ESI) for the manuscript entitled:

Photo-cross-linkable star-shaped polymers with poly(ethylene glycol) and renewable cardanol side groups; synthesis, characterization, and application to antifouling coatings for filtration membranes

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EXPERIMENTAL SECTION

Synthesis of P(HCPMA). HCPMA (2.2 g, 5.0 mmol), AIBN (81 mg, 0.50 mmol), and THF (7 mL) were added to a round-bottom flask equiped with condenser and magnetic stirring bar. The mixture was stirred under reflux condition for 24 h, and then poured into an excess of water/methanol (1/3). The precipitate was further purified by repeated dissolution-precipitation procedure. After dried under vacuum, P(HCPMA) was obtained with yield of 1.26 g. ^{1}H NMR (300MHz, $CDCl_3$, δ/ppm, TMS ref): 7.15 (aromatic), 6.71–6.75 (aromatic), 4.97–5.80 (m, –CH_2CH=C$H$$CH_2$–), 3.94–4.23 (m, –O$CH_2CH(OH)CH_2$OC(O)–), 4.1 (C$H_2$-O-C(O)), 2.75–2.90 (m, –CH_2CH=CHCH_2CH=CH–), 2.57 (t, –$OC_6H_4CH_2$–), 2.02 (m, –$CH_2CH_2CH_2$CH=CHCH_2–), 1.60 (m, $CH_3(CH_2)_{12}CH_2CH_2$–), 1.20–1.40 (m, $CH_3(CH_2)_{12}CH_2$–), 0.88 (t, –CH_3), 0.7–2 (methacrylate backbone, CH_2-C(CH_3)(C=O)). GPC-RI analysis: M_n = 8,200, PDI = 2.30.

Characterization. Surface micrographs of the membranes were inspected by scanning electron microscopy (SEM) using a field emission scanning electron microscope (FESEM, Nanosem 430). Contact angles of water sessile drop on membrane surfaces were measured by a Krüss DSA10 contact angle analyzer interfaced to a computer running drop shape analysis software. The contact angles for each sample were measured more than five times on five independently prepared membranes, and the values were averaged.

Table S1. XPS elemental composition (in at.%) of the surfaces of SPC13-, SPC24-, and SPC45-coated membranes without UV curing.

Sample	C 1s	O 1s	Si 2p	S 2p	O/C
SPC13[a]	76.04	23.31	0.65	–[b]	0.31
SPC24[a]	77.24	22.13	0.63	–[b]	0.29
SPC45[a]	78.06	21.45	0.49	–[b]	0.27

[a]After coated on PSf membrane by 1 wt % MeOH solution (without UV curing). [b] Not detected.

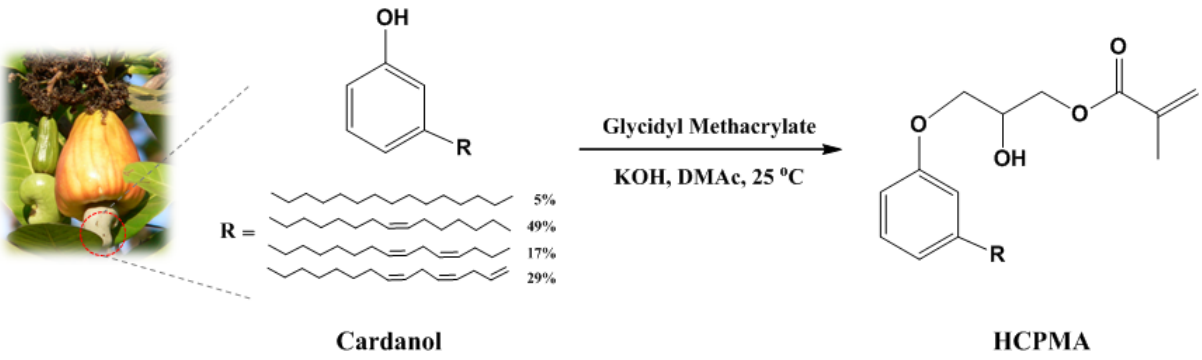

Fig. S1 Synthesis of 2-hydroxy-3-cardanylpropyl methacrylate (HCPMA).

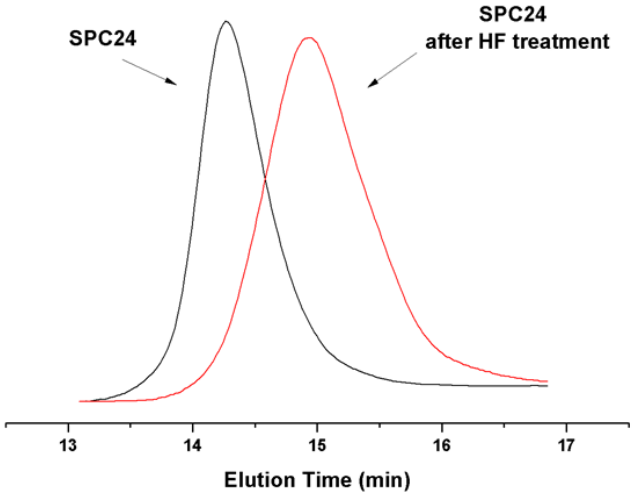

Fig. S2 GPC traces of SPC24 and the corresponding product cleaved from the star-shaped polymer after HF treatment.

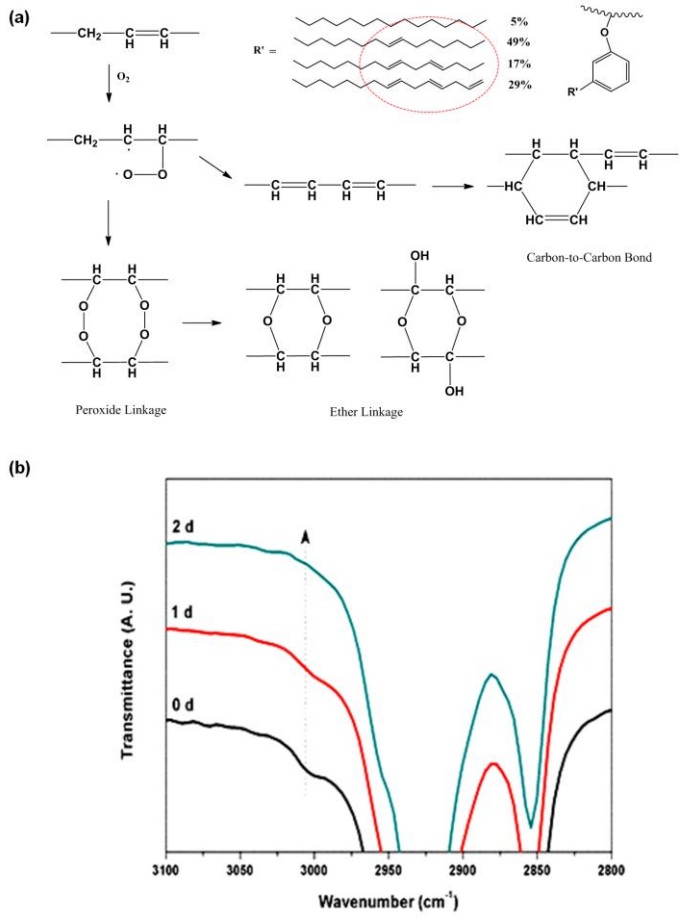

Fig. S3 (a) Suggested mechanism for photo-cross-linking of cardanol moieties by oxidation under UV irradiation and (b) FT-IR spectra of P(HCPMA) homopolymer with different UV irradiation time.

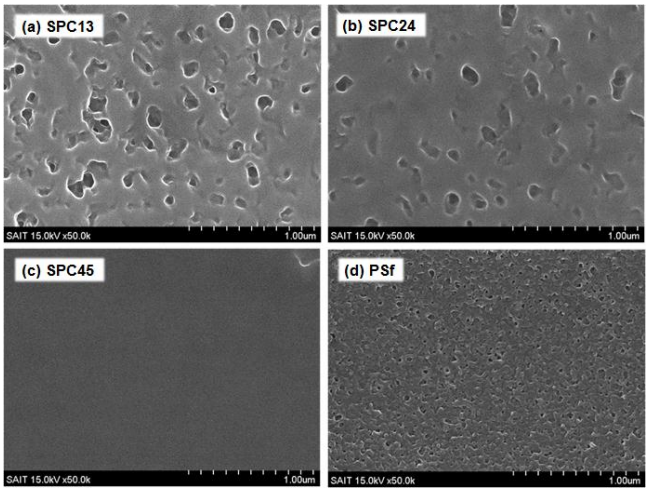

Fig. S4 SEM micrographs of the membrane surfaces. (a) SPC13-coated, (b) SPC24-coated, and (c) SPC45-coated membranes with UV curing, and (d) bare PSf membrane.

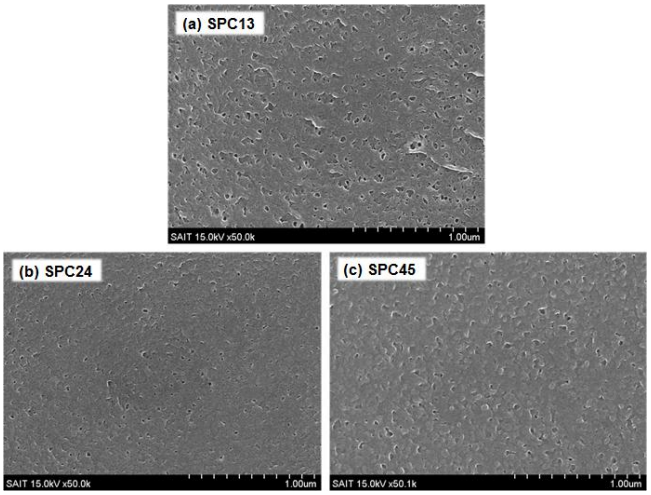

Fig. S5 SEM micrographs of the membrane surfaces without UV curing. (a) SPC13-coated, (b) SPC24-coated, and (c) SPC45-coated membranes.

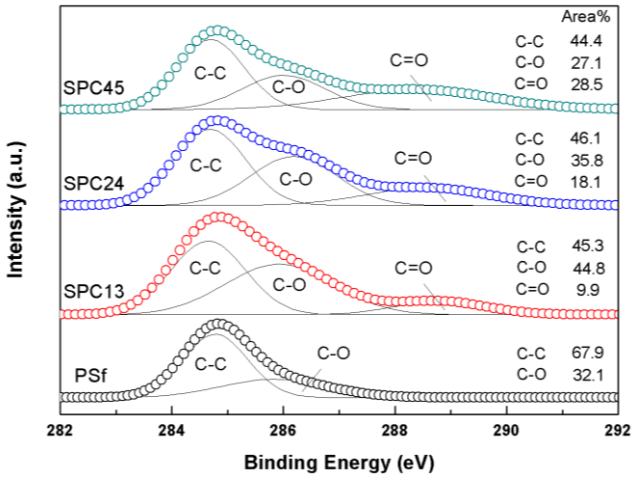

Fig. S6 XPS C 1s core level spectra of membrane surfaces coated with SPC13, SPC24, and SPC45, and PSf membrane surface.

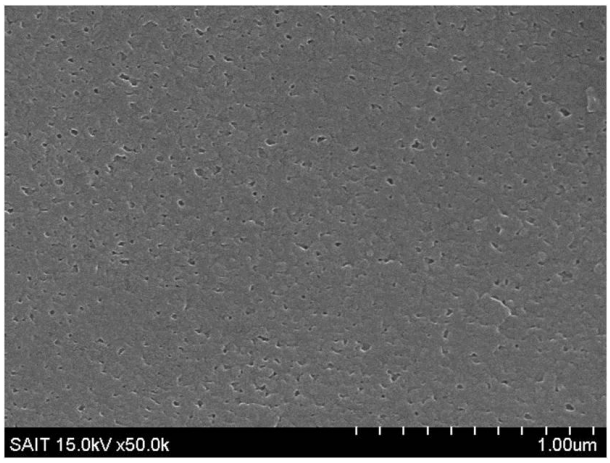

Fig. S7 SEM micrograph of the SPC13-coated membrane surface (without UV curing) after 3 h of pure water filtration.

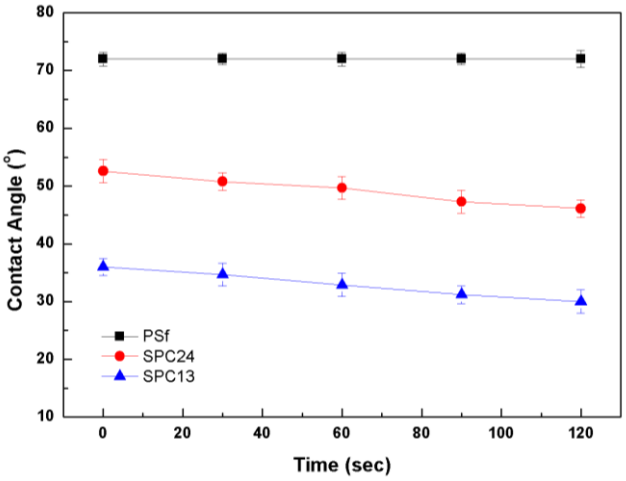

Fig. S8 Sessile drop water contact angles on the surfaces of SPC13- and SPC24-coated membranes, and bare PSf membrane.