Supporting information

Ultrathin in situ silicification layer developed by electrostatic attraction forced strategy for ultrahigh-performance oil-water emulsions separation

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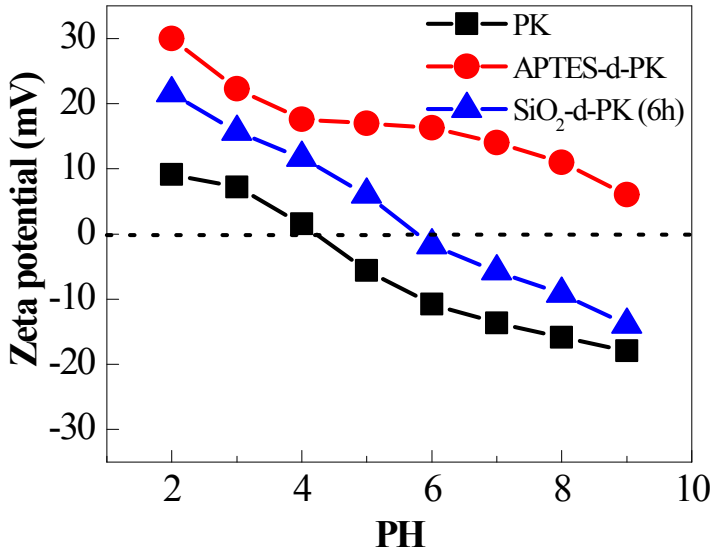

Fig. S1. The surface zeta potential of nascent PK substrate, APTES-d-PK membrane, and SiO_2-d-PK membrane at the PH values of 2-9.

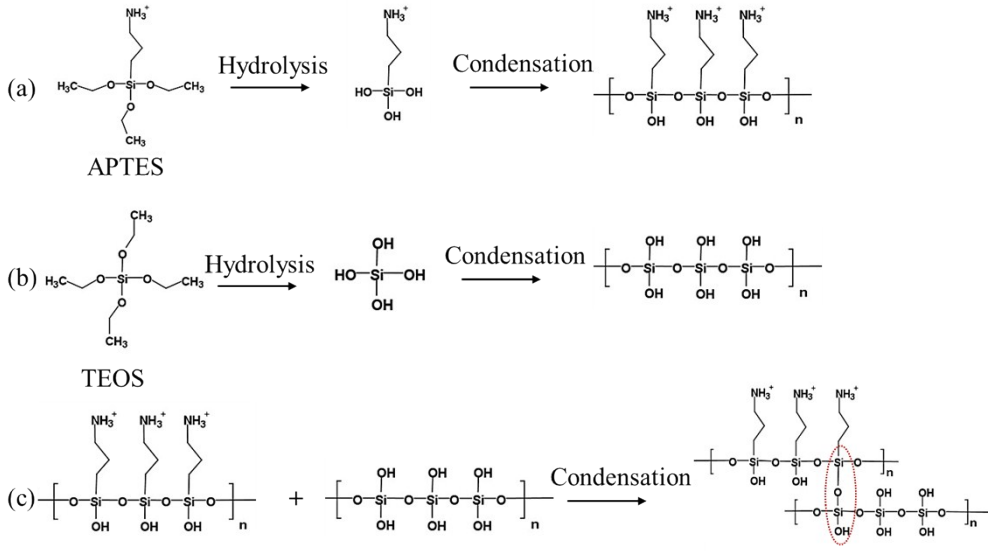

Fig. S2. The mechanism of electrostatic attraction forced in-situ surface silicification for the preparation of SiO_2-d-PK membrane: (a) the hydrolysis and condensation process of APTES monomer; (b) the hydrolysis and condensation process of TEOS monomer; (c) the condensation process between the surface silicification layer with APTES layer.

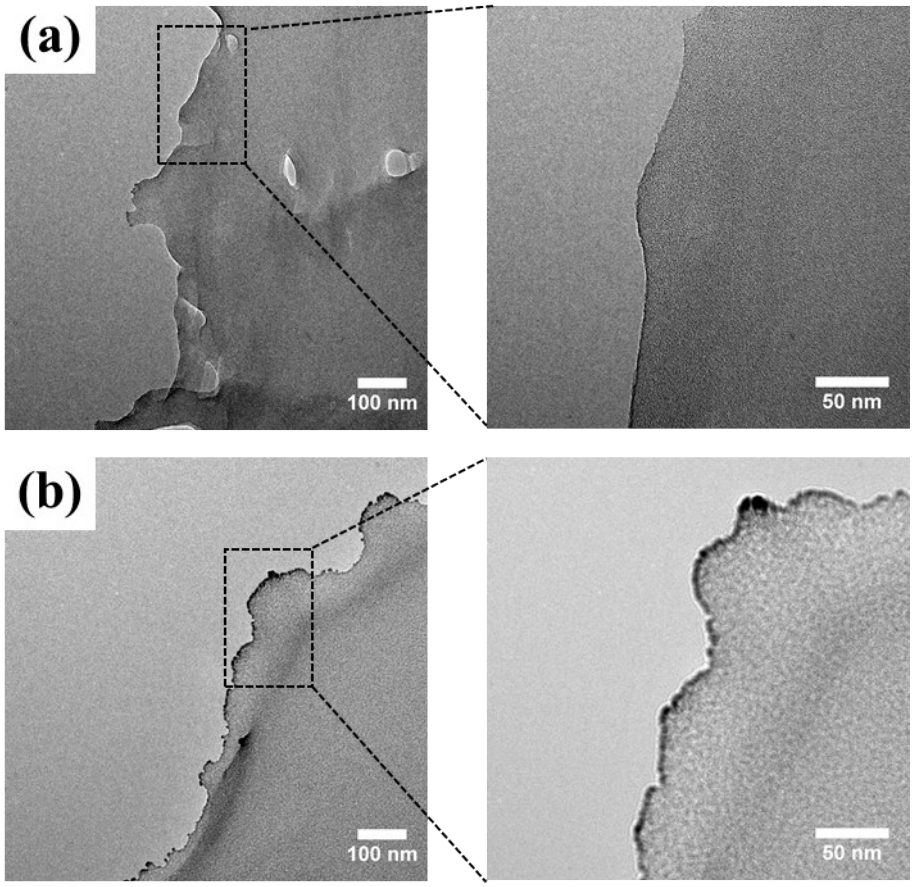

Fig. S3. TEM cross-sectional images of (a) PK and (b)SiO_2-d-PK membranes.

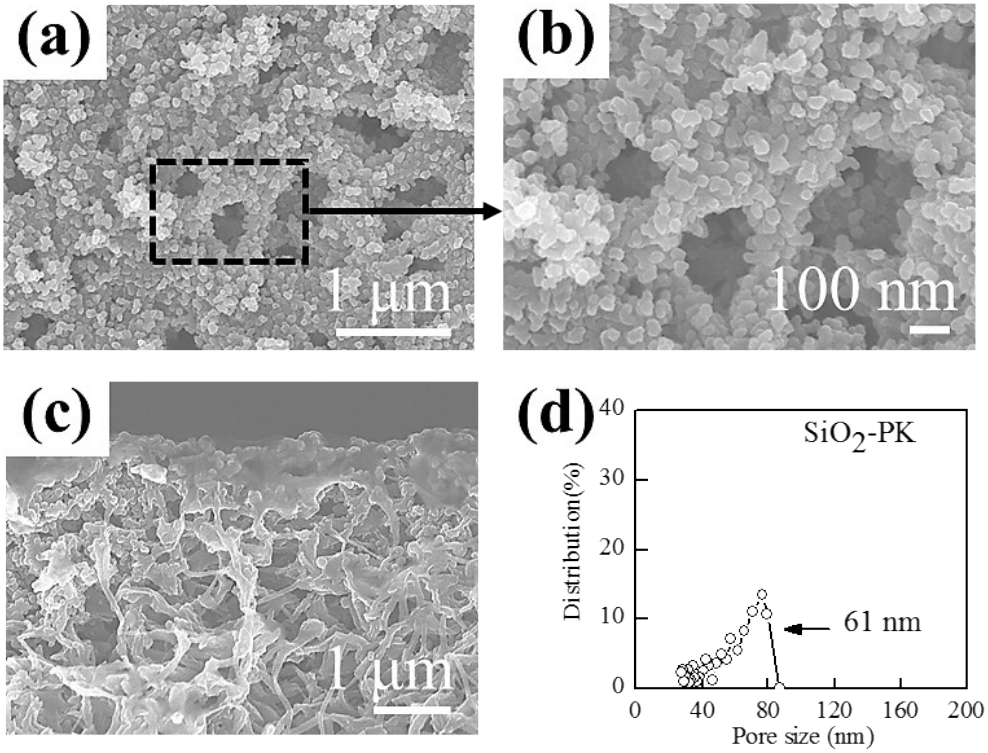

Fig. S4. Morphologies and pore size of the SiO_2-PK membrane without APTES pretreatment:(a) surface morphology; (b) enlarged surface morphology; (c) cross-section morphology; and (d) pore size distribution.

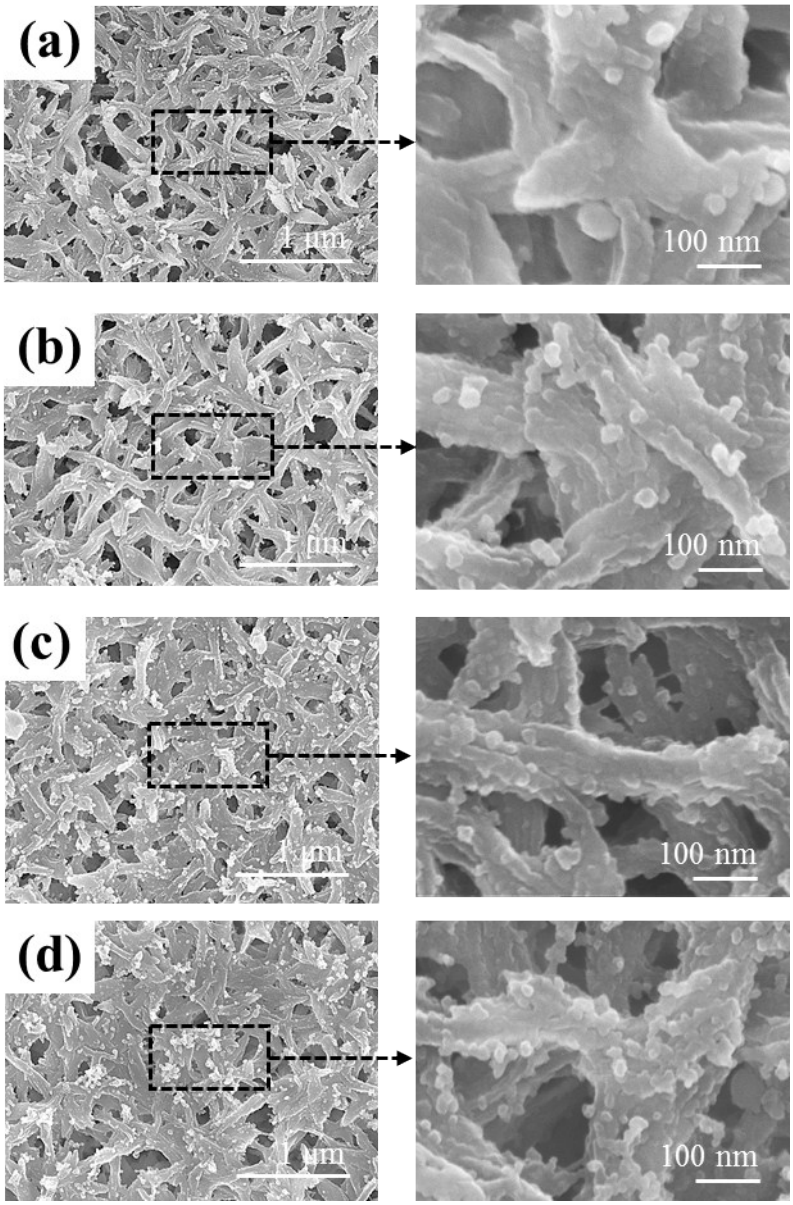

Fig. S5. The surface morphologies of SiO_2-d-PK membranes over the prolonged silicification process: (a) 1h; (b) 3h; (c) 6h; (d) 9h.

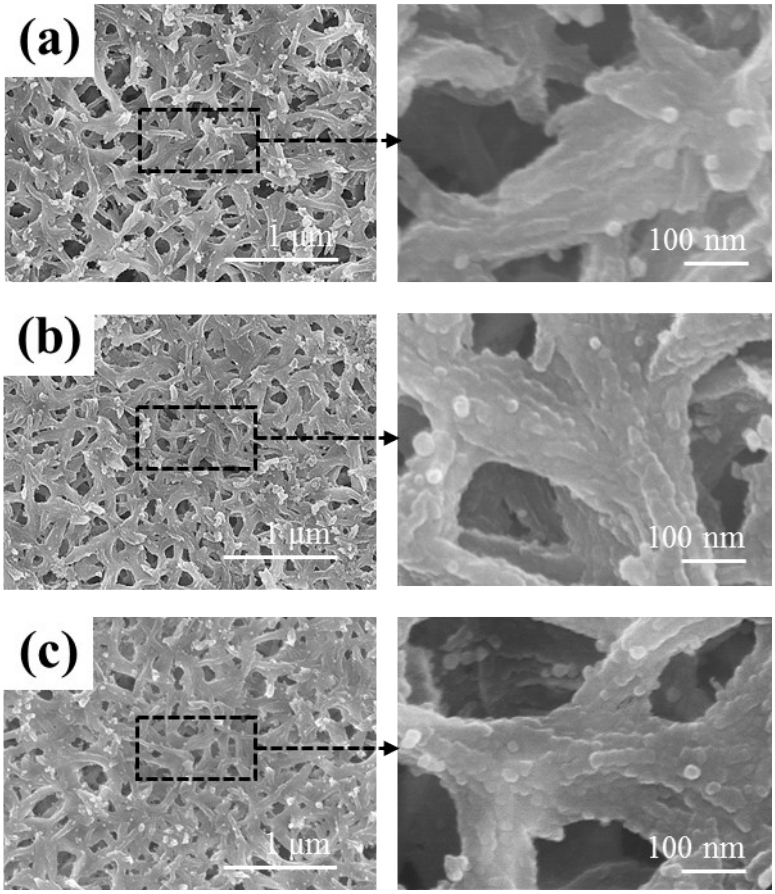

Fig. S6. The surface morphologies of SiO_2-d-PK membranes with different TEOS concentrations under the same surface silicification period of 6 h: (a) 3 ml, (b) 5ml, and (c) 7 ml in 100 ml ethanol solutions.

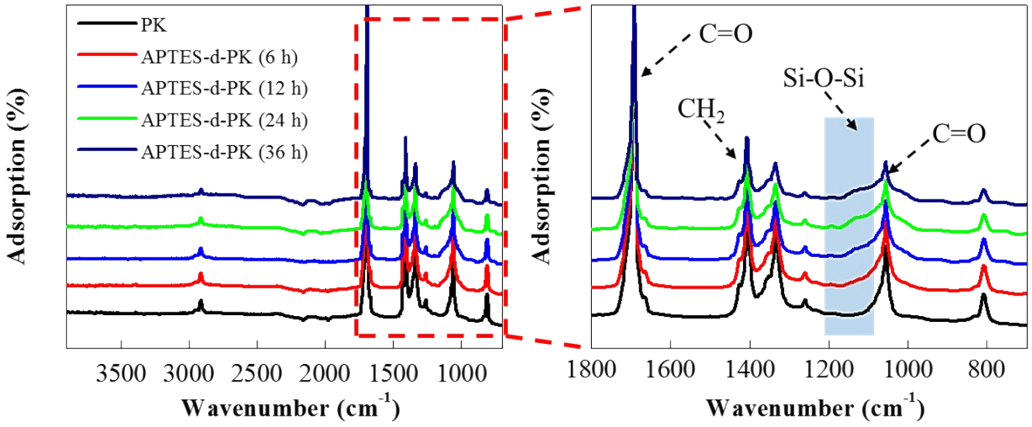

Fig. S7. FTIR characterization results of the PK and APTES-d-PK membranes with different deposition time.

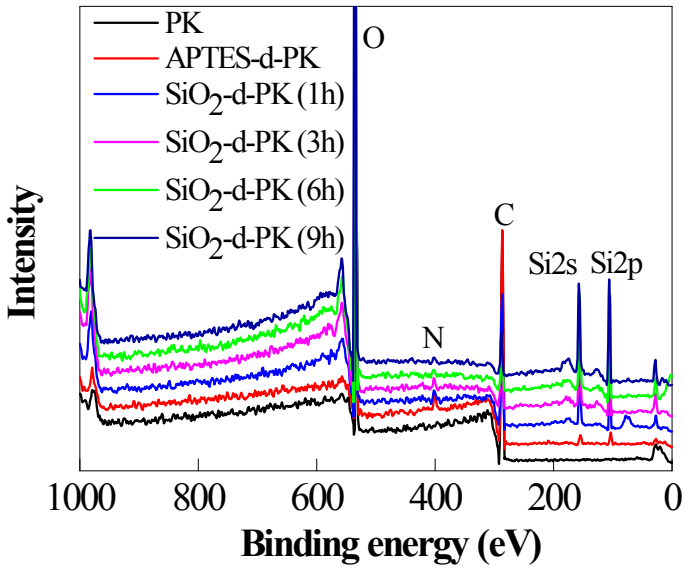

Fig. S8. XPS characterization results of PK, APTES-d-PK, and SiO_2-d-PK membranes.

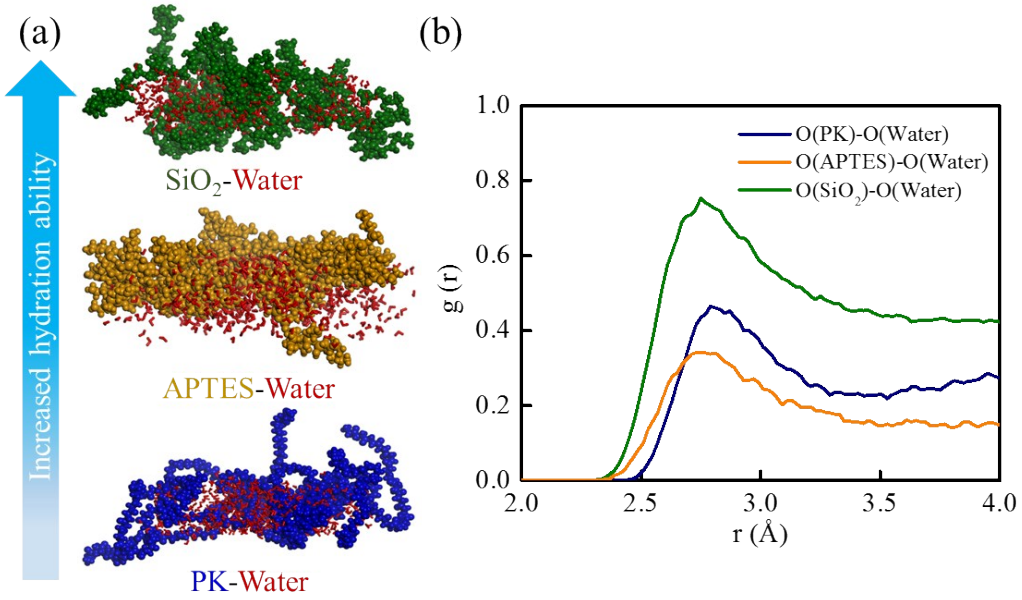

Fig. S9. MD simulation results of (a) models between water molecules and PK, APTES, and SiO_2 within 3.5 Å, where the molecular chains are colored as follows: PK: blue; APTES: yellow; SiO_2: green; water: red; (b) RDF analysis between the oxygen atom of water and the oxygen atoms of PK, APTES, and SiO_2.

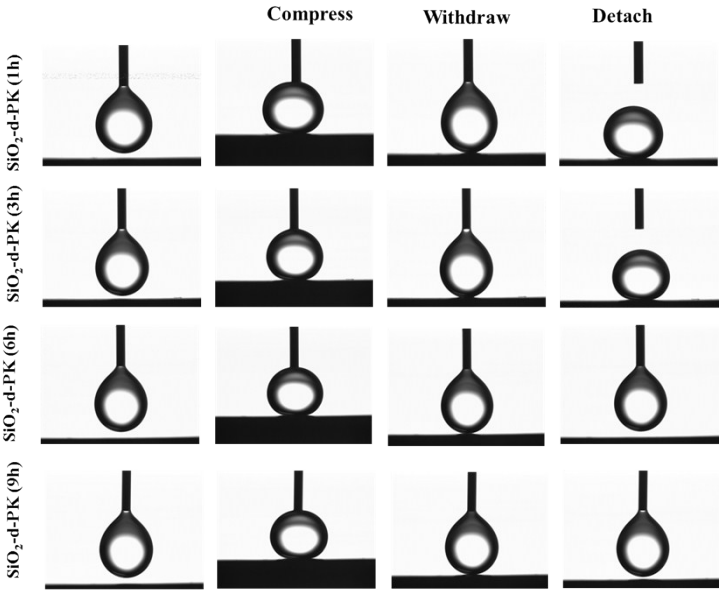

Fig. S10. Underwater dynamic oil-adhesion tests on the SiO_2-d-PK membranes surface prepared under different silicification periods, and the chloroform was used as the probe oil in this test.

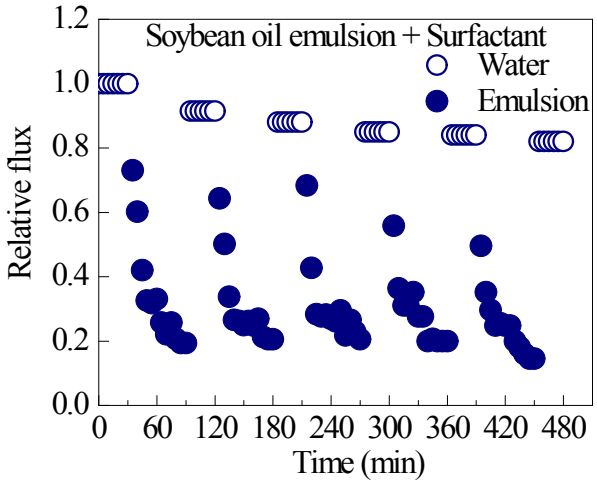

Fig. S11. Antifouling property of SiO_2-d-PVDF membrane for soybean oil-in-water emulsion.

Table S1. The surface porosities of the as-prepared membranes

membranes	PK	APTES-d-PK	SiO_2-d-PK
Surface porosity (%)	44.3 ±4.8	43.4 ±0.8	41.0 ±4.2