Supporting Information

Polydopamine-modified Graphene Oxide Nanocomposite Membrane for Proton Exchange Membrane Fuel Cell under Anhydrous Conditions

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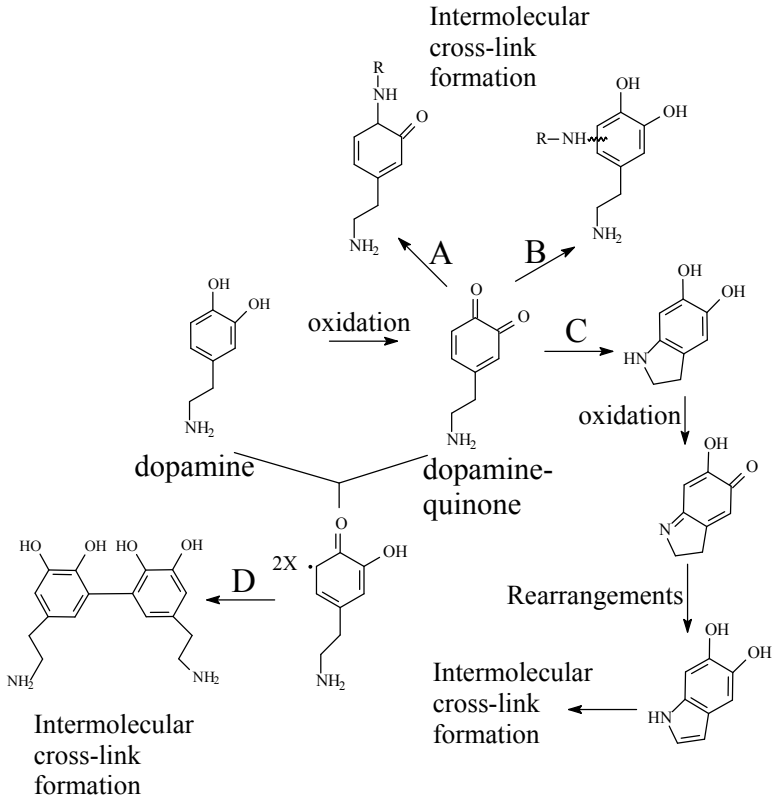
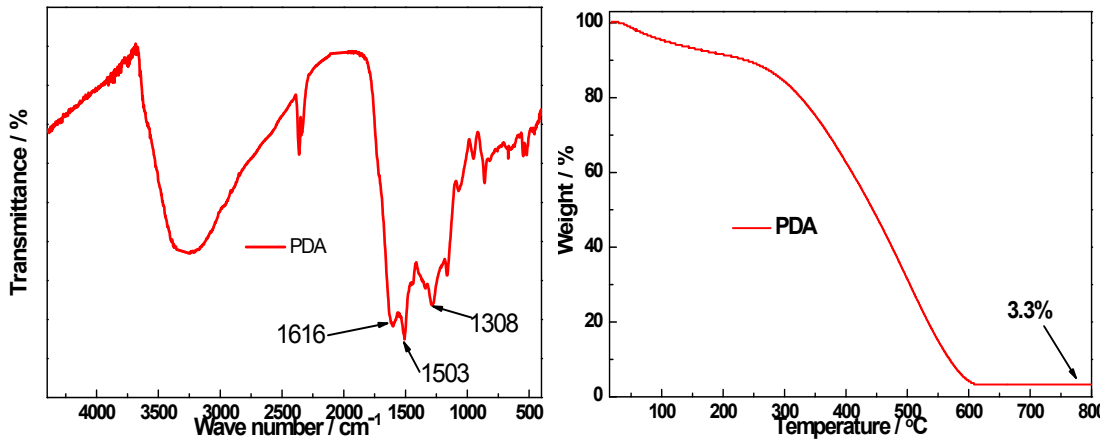
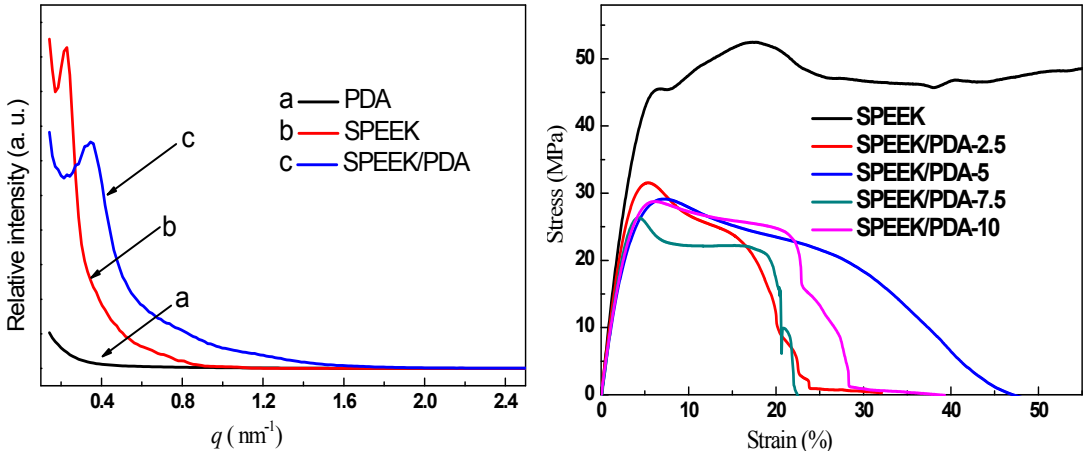


Figure S1. Possible structural evaluation and polymerization mechanism of dopamine: A) Schiff based substitution; B) Michael-type addition; C) Intramolecular cyclization; and D) Aryl-aryl coupling. (F. Pana, H. Jia, S. Qiao, Z. Jiang, J. Wang, B. Wang, Y. Zhong, *J. Membr. Sci.* **2009**, *341*, 279.]

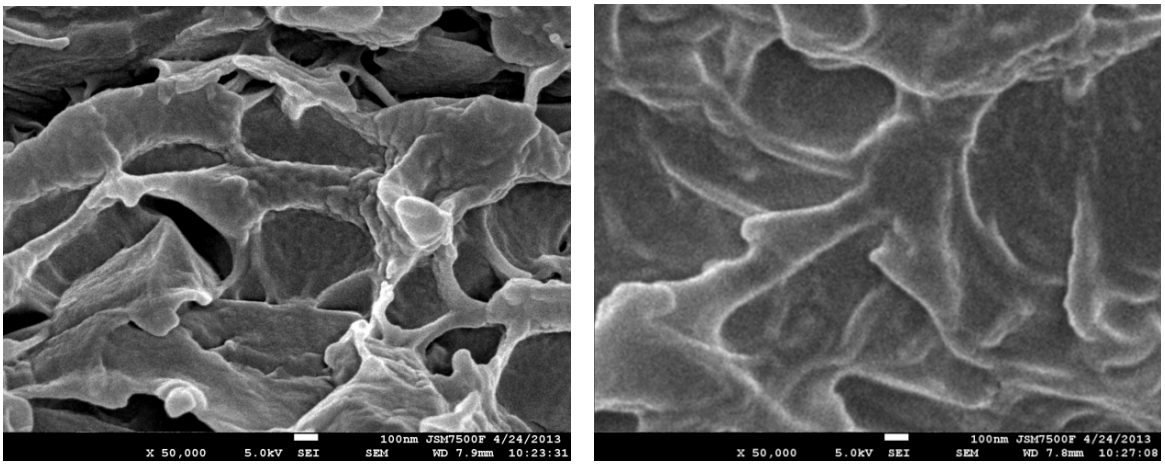


(a) (b)



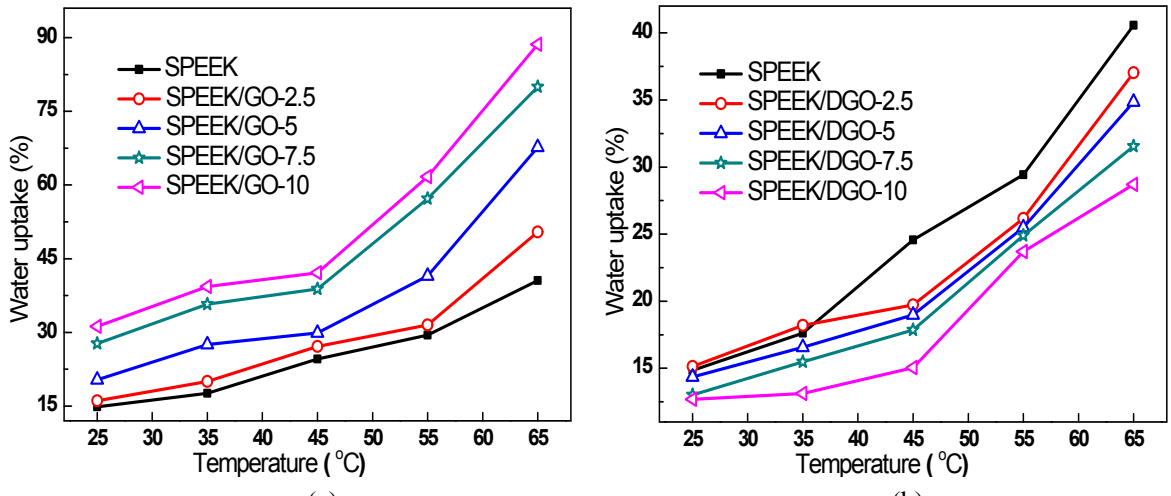
(c) (d)

Figure S2. The FTIR (a) and TGA (b) curves of PDA; (c) the SAXS of PDA and SPEEK/PDA; and (d) the stress-strain curves of SPEEK/PDA.

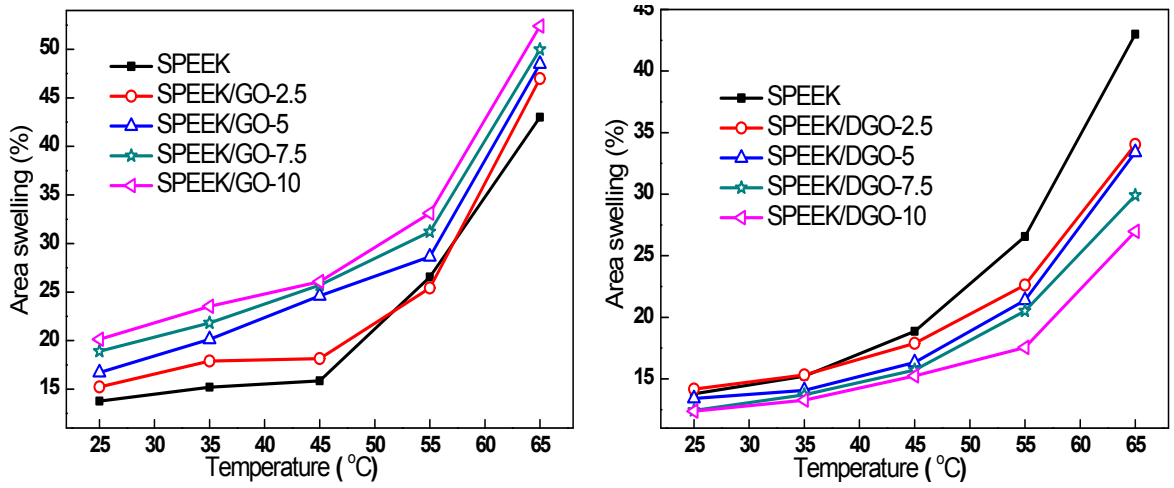


(a) (b)

Figure S3. SEM images of the cross-section of (a) SPEEK/GO-5 and (b) SPEEK/DGO-5.



(a) (b)



(c) (d)

Figure S4. (a and b) Water uptake and (c and d) area swelling of SPEEK control membrane, SPEEK/GO-X and SPEEK/DGO-X at the temperature ranging 25 to 65 °C.

Water uptake of the membrane was determined by measuring its weight difference before (W_{dry}, g) and after (W_{wet}, g) immersion in water for 48 h at 25 °C. The final water uptake was the average of three measurements with an error within ±4.0% and calculated using the equation: water uptake (%) = (W_{wet} – W_{dry}) / W_{dry}×100. Area swelling of the membrane was determined in a similar manner: soaking the pre-measured membrane (A_{dry}, cm^2) in de-ionized water for 48 h at 25 °C, then re-measuring to obtain the wetted membrane area (A_{wet}, cm^2). Area swelling was defined as area swelling (%) = (A_{wet} – A_{dry}) / A_{dry}×100.

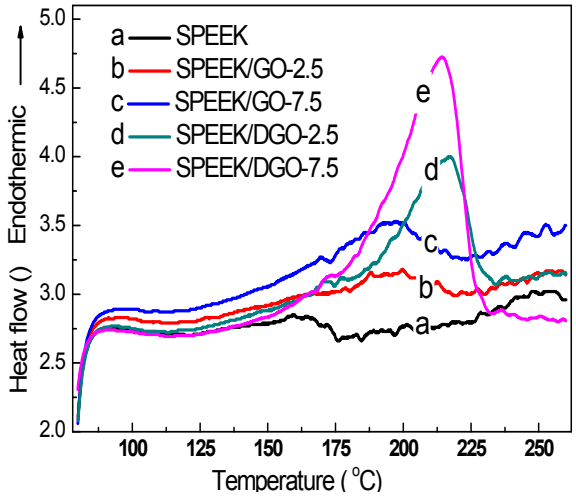


Figure S5. DSC curves of SPEEK control membrane, SPEEK/GO-X and SPEEK/DGO-X.

Differential scanning calorimetry (DSC) was obtained on a 204 F1 NETZSCH and the sample was first preheated from room temperature to 120 °C with 10 °C min^{-1} under nitrogen atmosphere, then cooled to 90 °C and reheated to 260 °C.

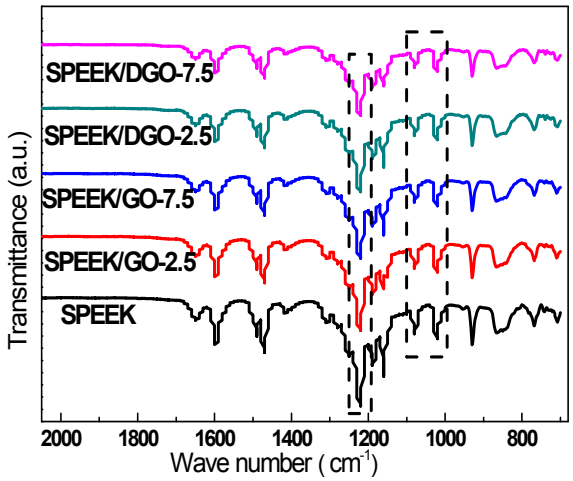


Figure S6. FTIR curves of SPEEK control membrane, SPEEK/GO-X and SPEEK/DGO-X.

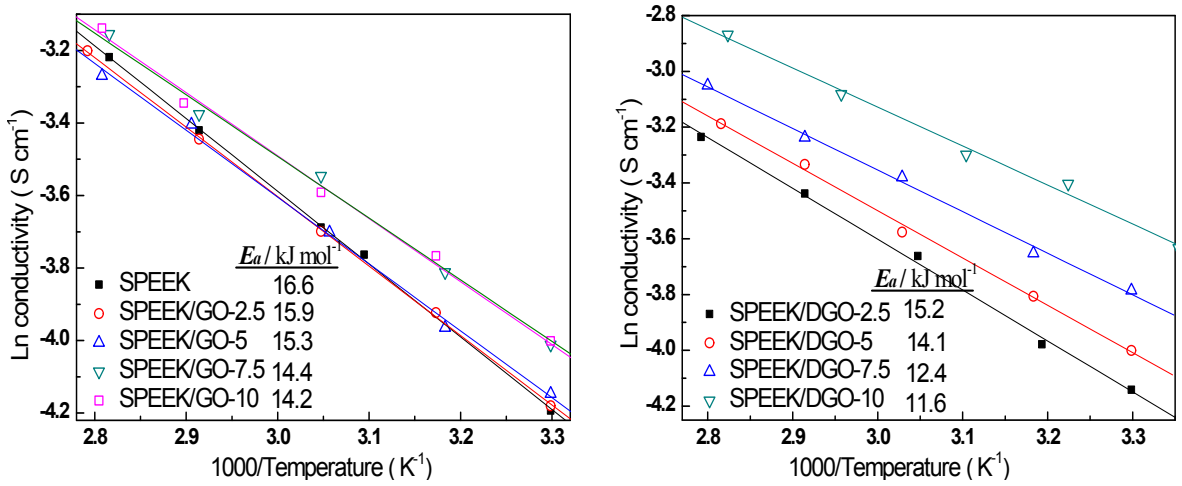


Figure S7. Temperature-dependent conductivity of the SPEEK control membrane and SPEEK/GO-X (a), and SPEEK/DGO-X (b) under hydrated conditions.

The values of the activation energy (E_a) for the samples were calculated using the Arrhenius equation $\sigma = \sigma_o \exp(-E_a/kT)$, where σ_o was a pre-exponential factor, k was the Boltzmann's constant, and the temperature T was in Kelvin.