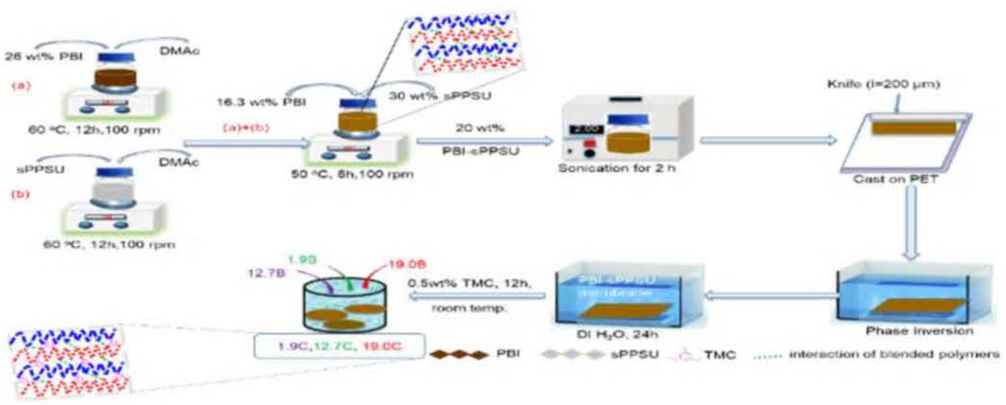
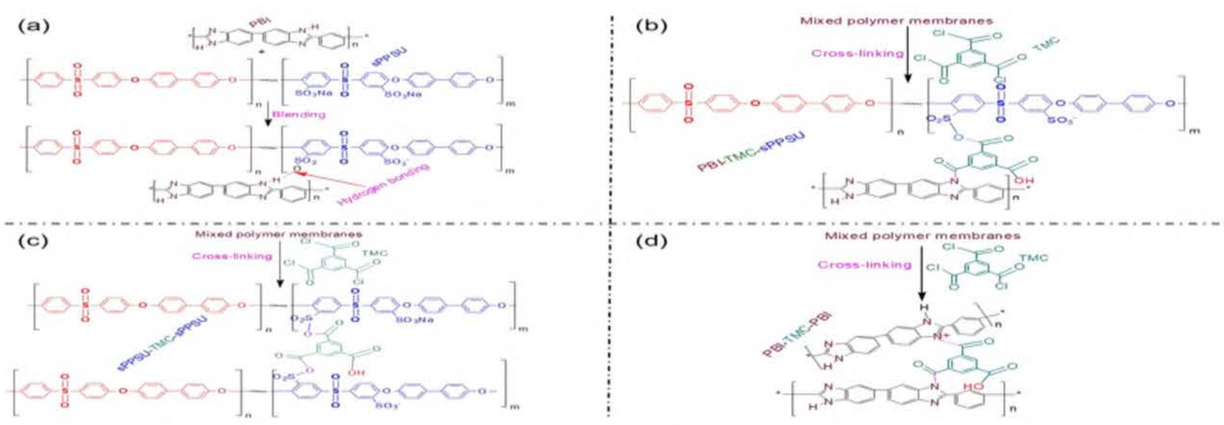
# Effects of sulfonation degree on compatibility and separation performance of polybenzimidazole (PBI)-sulfonated polyphenylenesulfone (sPPSU) blend membranes

Graduate Institute of Applied Science and Technology, National Taiwan University of Science and Technology

Siyum Shewakena, 3rd year PhD , Prof. (Neal) Tai-Shung Chung

**Introduction**: Organic solvents are widely used in manufacturing processes, but their disposal can have unfavorable effects on the environment and the economy. Analogously, pesticide leakage—a known environmental problem that can seriously harm ecosystems and public health—occurs when pesticides from farmed fields leak into nearby waterways. Developing membranes that can withstand and operate effectively in such harsh environments is key for their practical and widespread application.



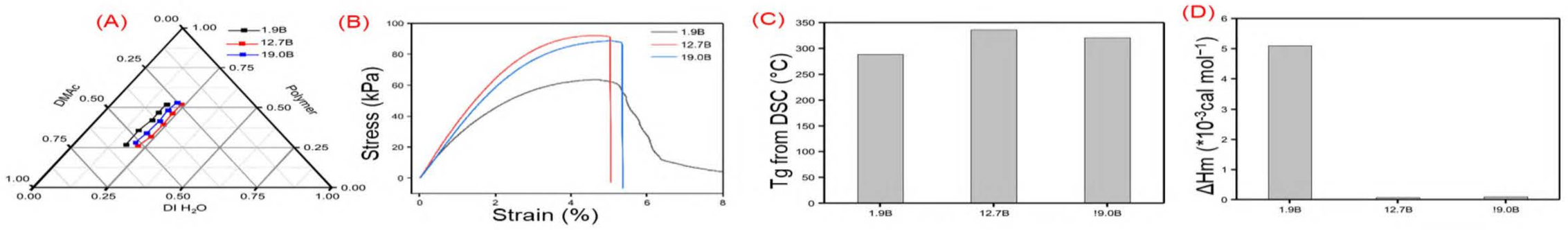




Fig. 3. (A) Ternary phase diagrams of PBI/sPPSU-DMAc-water systems; (B) the stress-strain curves and (C) Tg values of the polymer blend membranes; and (D) enthalpy of mixing (ΔHm) values of different PBI and sPPSU blends.

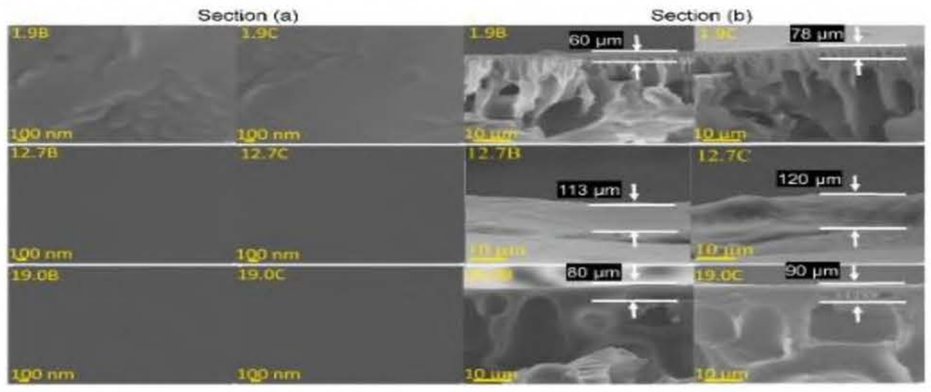



Fig.3. SEM images of (a) the top surfaces and (b) cross-sectional images of the membranes at magnifications of ×50,000 for the outer surface and ×2000 for the cross-section.

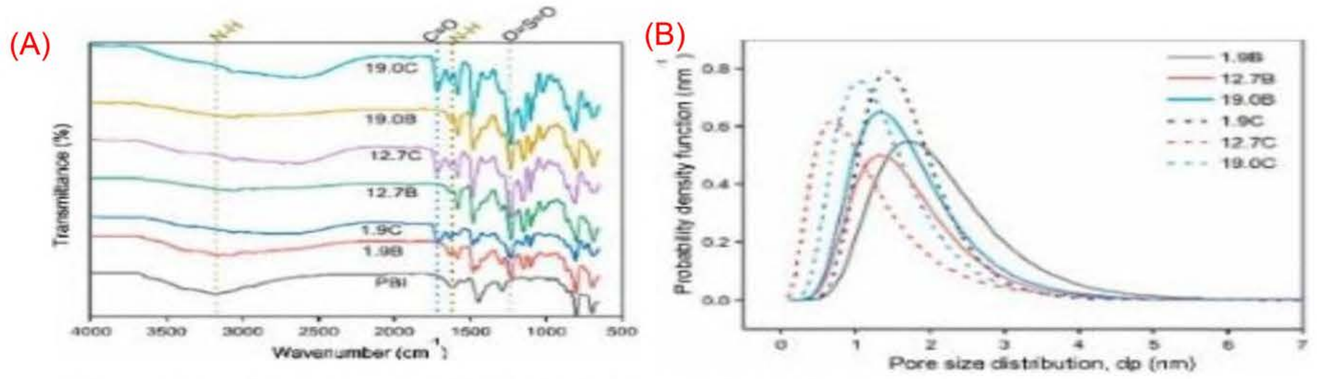



Fig. 4. (A)) FTIR spectra; and (B) Pore size distributions of the fabricated membranes.

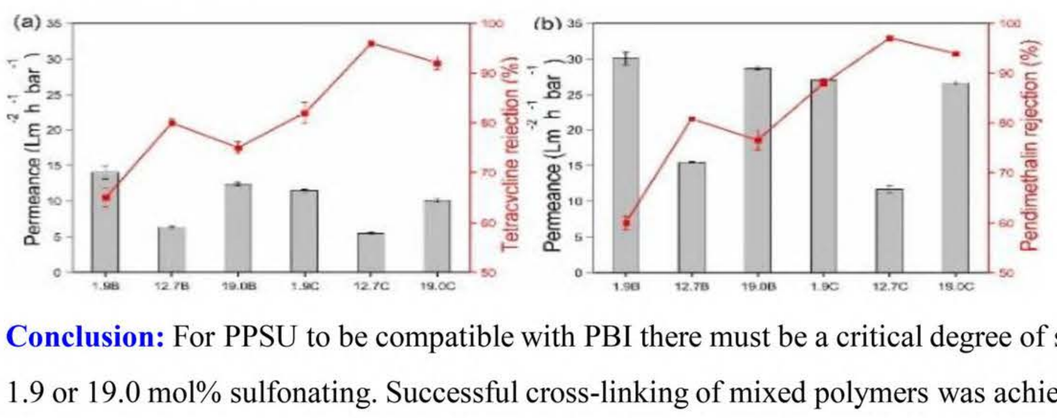



Fig. 5. The fabricated membranes: (a) permeance of ethanol and rejection of tetracycline (444.4 Da); (b) permeance of water and rejection of pendimethalin (281.3 Da) (feed concentration of 50 ppm, at a transmembrane pressure of 5 bar and room temperature).

**Conclusion:** For PPSU to be compatible with PBI there must be a critical degree of sulfonation. PBI and 12.7-mol% sPPSU have a much better degree of compatibility than PBI and 1.9 or 19.0 mol% sulfonating. Successful cross-linking of mixed polymers was achieved in a single step. Blends with high compatibility exhibit superior mechanical characteristics, filtration efficacy, and chemical stability.