

# Hydrocarbon-Based Composite Membrane Using LCP-Nonwoven Fabrics for Durable Proton Exchange Membrane Water Electrolysis

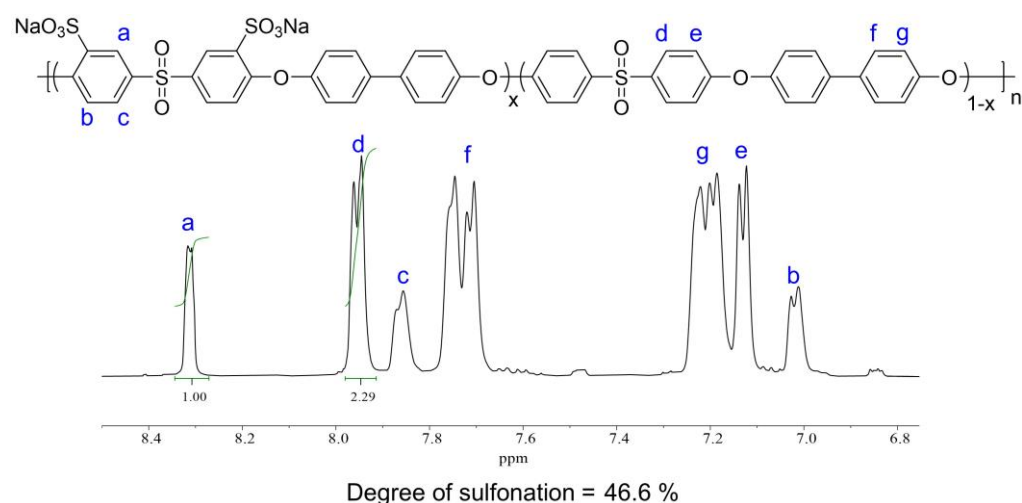
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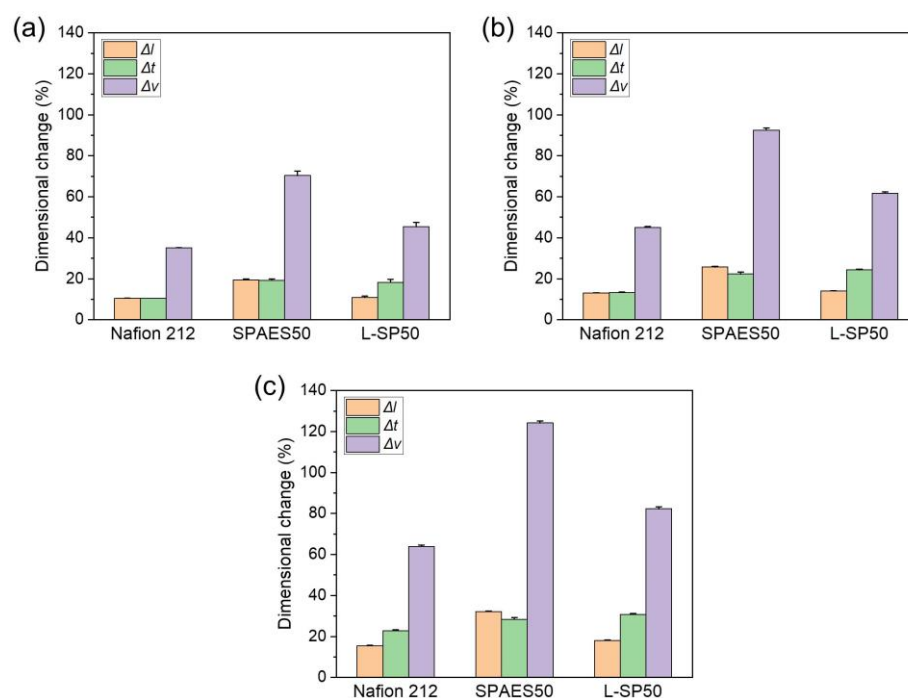
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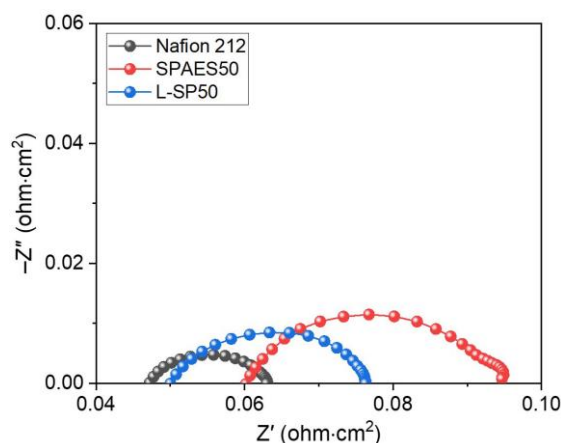
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**Figure S1.** <sup>1</sup>H NMR spectrum and degree of sulfonation of the synthesized SPAES50 copolymer.



**Figure S2.** Changes in the length, thickness, and volume of the Nafion 212, SPAES50, and L-SP50 membranes in water; (a) 25 °C, (b) 50 °C, and (c) 80 °C.



**Figure S3.** EIS analysis measuring the resistances ( $R_\Omega + R_{ct}$ ) of the Nafion 212, SPAES50, and L-SP50 membranes in PEMWE (water flow rate (anode): 30 mL/min; operating temperature: 80 °C; DC potential: 1.7 V; AC frequency: 50 mHz–30 kHz; active area: 5  $\text{cm}^2$ ).