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Preparation and Characterizations of Triptycene Integrated Poly (Arylene Ether Sulfone) Based Block and Random Copolymers
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Abstract
The present study aims to synthesize porous poly (arylene ether sulfone) (PAES) copolymers infused with triptycene monomer, prepared via two synthesis methods: block and random copolymerization. The morphologies and properties of both synthesized PAES copolymers were further studied and compared. Obtained results showed that all the procured triptycene monomers, oligomers, and PAES copolymers were successfully synthesized and verified through proton nuclear magnetic resonance (1HNMR) and Fourier-Transform Infrared Spectroscopy (FTIR) analyses. Gel Permeation Chromatography (GPC) showed that the obtained random PAES copolymer exhibited higher molecular weight than block PAES copolymer. At the same time, the thermogravimetric analysis demonstrated that the triptycene-integrated block PAES copolymer was slightly more thermally stable than the random PAES copolymer. After the membrane preparation, Field Emission Scanning Electron Microscopy (FESEM) and porosity studies documented that the block PAES copolymer membrane exhibited larger pore size with increased porosity compared to the random PAES copolymer membrane. The current study also found that both pore size and porosity could improve water uptake and the ion exchange capacity of the PEMs. The block PAES membrane also recorded superior proton conductivity compared to the random PAES copolymer membrane. The membrane procured in this study displayed workability in the PEMFC test at an operating temperature of 80°C and 60% RH. It is shown that the morphology and properties of the synthesized polymer varied when different synthesis methods were applied.

Author Keywords
Block copolymer; Morphology; Poly (arylene ether sulfone); Random copolymer; Triptycene

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