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Hydrocarbon-based electrode ionomer for proton exchange membrane fuel cells

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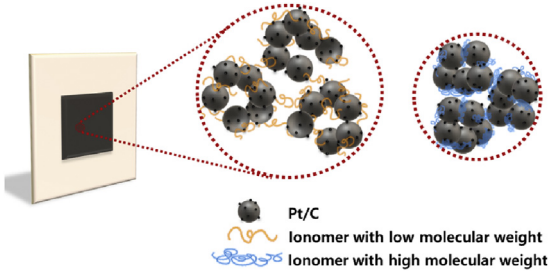
HIGHLIGHTS

- Synthesis of polymer electrolytes which have different molecular weight (MW).
- Fabrication of membrane electrode assembly with different MW polymer electrolyte binder.
- Optimization of electrode configuration for high fuel cell performance.

GRAPHICAL ABSTRACT



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ABSTRACT

The electrode ionomer is a key factor that significantly affects the catalyst layer morphology and fuel cell performance. Herein, sulfonated poly(arylene ether sulfone)-based electrode ionomers with polymers of various molecular weights and alcohol/water mixtures were prepared, and those comprising the alcohol/water mixture showed a higher performance than the ones prepared using higher boiling solvents, such as dimethylacetamide; this is owing to the formation of the uniformly dispersed ionomer catalyst layer. The relation between ionomer molecular weight for the same polymer structure and the sulfonation degree was investigated. Because the chain length of polymer varies with molecular weight and chain entanglement degree, its molecular weight affects the electrode morphology. As the ionomer covered the catalyst, the agglomerates formed were of different morphologies according to their molecular weight, which could be deduced

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