Development of Novel Phosphorylated Cellulose Acetate Polyelectrolyte Membranes for Direct Methanol Fuel Cell Application

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A novel phosphorylated cellulose acetate membranes (PCA) was prepared using epichlorohydrin as an activating agent and evaluated as a potential polyelectrolyte membrane for DMFC applications. The PCA membranes exhibit higher water uptake, low methanol uptake. Thermal oxidation stability, TGA, and tensile characterization impelled good thermomechanical stability than the native CA membranes. Furthermore, the PCA membranes are found to have a low methanol permeability ($2.4 \times 10^{-15} \text{ cm}^2/\text{s}$) which much smaller than that of Nafion membranes ($1.14 \times 10^{-9} \text{ cm}^2/\text{s}$). The basic manufacture technology and cheapness of CA polymer recommend this candidate for fuel cells application. In conclusion, the formulated PCA membranes can be applied as new polyelectrolyte membranes for the DMFCs application.

Keywords: Activation; Phosphorization; Cellulose acetate membrane; Fuel cell; Ions exchange capacity, polyelectrolyte membranes.

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