Synthesis and Characterization of a Composite Anion Exchange Membrane for Water

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Anion exchange membranes (AEM) have gained attention recently as a promising candidate for low-cost water electrolysis systems to produce hydrogen, linked with renewable energy resources as a sustainable alternative to fossil fuels. The development of potential materials for producing and analyzing AEM is an imperative step towards commercialization and plays a competitive role in the hydrogen production industry. In this article, we developed a composite anion exchange membrane prepared by activating a commercial support structure (Celgard® 3401) with a commercially available functional group (Fumion® FAA-3) through a phase-inversion process. Fourier-transform infrared spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) analysis demonstrated the phase inversion procedure as an effective methodology. Furthermore, the cell performance test result (with Celgard/Fumion) was very promising and even better than a commercial membrane commonly applied in alkaline electrolysis (Fumasep). We also developed a testing procedure for membrane performance evaluation during electrolysis, which is critical considering the effect of CO2 absorption on membrane conductivity.