Supporting Information

Optimized Electrode Structure for Performance and Mechanical Stability in Direct Formate Fuel Cells using Cation Ionomer

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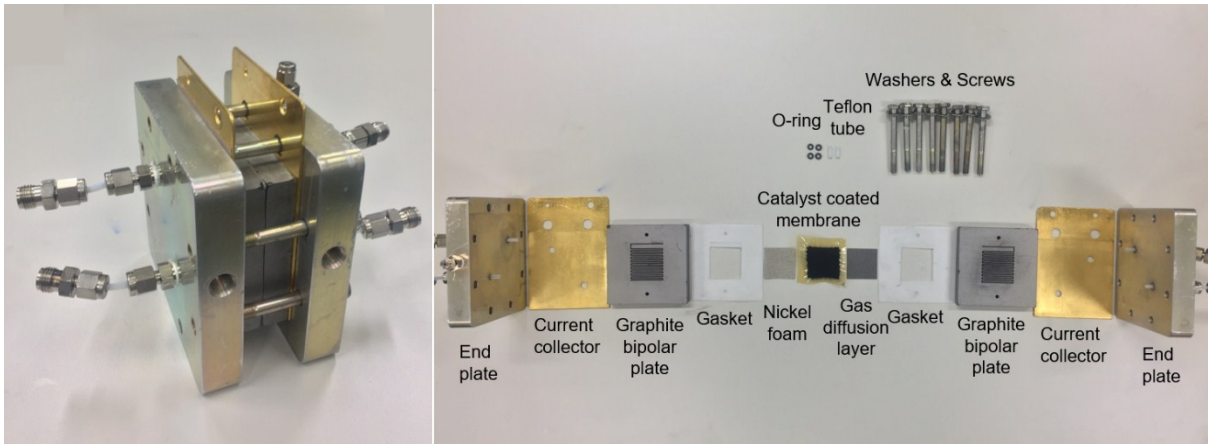

Figure S1. A photograph of the DFFC construction and its details.

The high loading of catalysts over 1 mg cm^{-2} is used in the field of alkaline liquid fuel cells. Likewise, the catalyst of 1 mg cm^{-2} was loaded on the membrane and carbon paper in this study. The cross-sectional SEM micrographs for 20% Pd/C show the thick catalyst layers on the membrane and carbon paper with almost similar thickness; it was measured to 68.58 μm on membrane and 70.79 μm on carbon paper, as shown in Fig. S2. Because the catalyst layers are thick, its surface property is rarely influenced by the substrates (carbon paper or membrane).

In addition, if the samples, the direct-sprayed catalyst layers on membrane, were immersed in liquid fuels for the physicochemical characterization, the over-shrinking and swelling membrane are able to destroy the catalyst layers. The adverse effect, caused by the membrane substrate, is able to make the analysis of physicochemical characterization inaccurate. Therefore, the use of carbon paper, which can serve as the sturdy substrate, is appropriate in observing the physicochemical characterization because this study focuses on the catalyst layers.

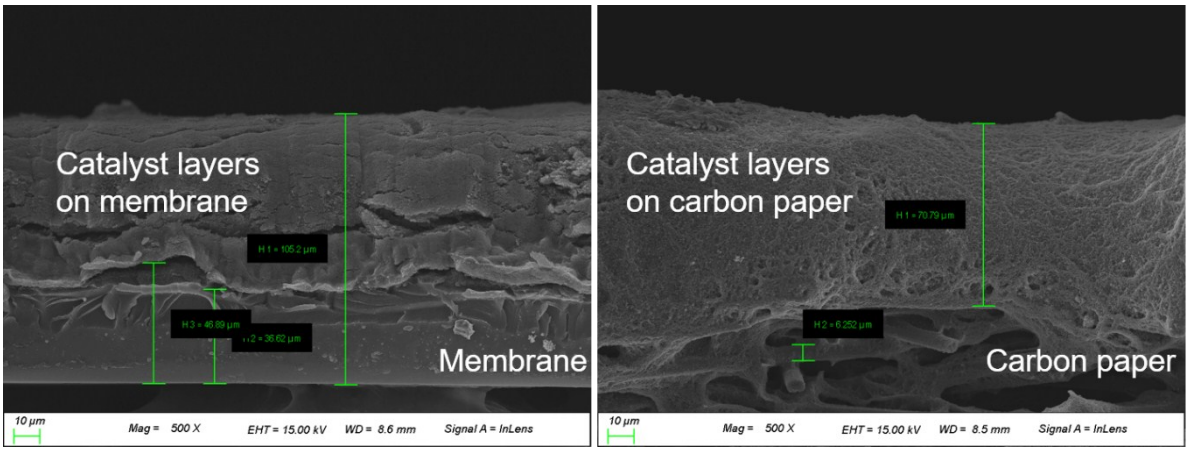

Fig. S2. A cross-sectional SEM micrographs for the Pd/C catalyst layer on membrane (left) and carbon paper (right).