



## Preparation of gas diffusion electrodes for high temperature PEM-type fuel cells

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### ABSTRACT

Gas diffusion electrodes (GDEs) were prepared and optimized for testing a novel electrolyte for PEM-type fuel cells operating at elevated temperatures based on polymer-supported ionic liquid (IL). For the construction of the GDE, a commercial E-TEK gas diffusion layer was employed. On its surface, a catalyst layer (CL) was deposited by the brushing technique. The catalyst ink contained a commercial, carbon-supported platinum catalyst (30 wt.% – E-TEK), polymer binder and solvents. As a binder, polytetrafluoroethylene (PTFE) or polybenzimidazole (PBI) was applied. Various amounts of binder were used in the CL. The utilization of PBI was found to be more advantageous than PTFE. 15 wt.% PBI was identified as the optimum amount in the CL. Such electrodes exhibit a relatively good performance in a laboratory-scale single fuel cell employing commercial PBI-based membranes doped by H<sub>3</sub>PO<sub>4</sub> (50 mW/cm<sup>2</sup> at 0.4 V and 140°C). Although polymer-supported IL-based membranes exhibit relatively high ionic conductivity, the performance of a fuel cell utilizing these membranes produced power output approximately 30 times lower compared to PBI-based membranes.

*Keywords:* Gas diffusion electrode; Polymer electrolyte; Ionic liquid; PBI; Fuel cell

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