

Development of a PEM Fuel Cell Stack with High Power and Efficiency

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A PEM (Polymer Electrolyte Membrane) fuel cell stack has been developed for a fuel cell module that must meet the following requirements: high electric efficiency and low exhaust-gas emissions. To achieve these requirements, we designed a cascade-type PEM fuel cell to be operated using pure hydrogen and oxygen as fuel and oxidant, respectively, under a high-pressure dead-end operation mode. We have also developed the major components of the cell stack, such as MEA (Membrane Electrode Assembly), bipolar-plate, and gasket, to meet the design requirements and target durability even in severe operating conditions: high gas inlet pressures and usage of pure oxygen. Finally, we assembled a high-power fuel cell stack using these components to verify its performance. The cell stack showed a good performance in terms of the electric efficiency, maximum power, and durability.