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Water Management of Micro-scale Direct Methanol Fuel Cell

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Abstract

During the operation of a DMFC, each hydrogen proton should be accompanied by several water molecules when drifting through the membrane. The reaction at the cathode side also produces water. However, too much water at the cathode side may result in flooding, which obstructs the oxygen reactant approaching the catalyst. The collection of excess water prevents flooding, and also allows for the pumping of that water back to the anode. As a result, the water is self-sufficient in the system and the storage space of the fuel cell can be used for storing pure methanol.

This proposed research is critical to the enabling of Micro Fuel Cells, with many times higher performance, for the replacement of batteries. This shall have a broad impact on hand-held devices, remote sensing, and portable communication, as well as unmanned systems such as micro robots, etc. The success of micro DMFCs shall create a very large market for battery replacement with much higher performance. This shall lead to creation of large development and manufacturing facilities in PA, and substantial employment shall also occur rather quickly.