



Water Management in the Porous Transport Layers of PEM Fuel Cells

By Robert Alink

Fraunhofer Verlag Feb 2015, 2015. Taschenbuch. Condition: Neu. Neuware - In this thesis, water management in Polymer Electrolyte Membrane (PEM) fuel cells is analyzed. To find strategies for minimizing the major loss mechanisms that occur due to flooding, a focus is put on liquid water transport in the porous transport layer (PTL). A novel method to visualize the liquid water percolation in the PTLs using an environmental scanning electron microscope (ESEM) is developed. Compared to existing visualization techniques, the method enables to phenomenologically investigate the liquid water transport mechanisms with low experimental cost and high temporal and spatial resolution. The water transport mechanisms are investigated by analyzing the impact of different local PTL modifications on the water management by applying ESEM and synchrotron imaging, in-situ performance characterization and water balancing. Different indications on a beneficial drainage effect are found, which results in a reduced saturation in the vicinity of the modifications in the fibrous substrate (FS). Further findings indicate that interfacial water between the microporous layer (MPL) and the catalyst layer is the most decisive for the success of the perforation approach but also for the performance with unmodified PTLs. The identified transport mechanisms are implemented in a 3-dimensional fuel...



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