

Effect of Microstructure on the Transport Coefficients, Electrochemical Properties, Performance and Durability of Catalyst Layers in PEM Fuel Cells

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ABSTRACT

The microstructure of catalyst layers (CLs) plays a significant role in the transport and electrochemical phenomena, which determines the performance and durability of PEM fuel cells. The microstructure of the CLs is sensitive to the fabrication processes, which can be affected by materials, formula, instruments, procedures and conditions. However, it is still challenging to quantitatively describe the microstructure of the CLs, and there is still no consensus on what the optimal CL microstructure is. This presentation reviews the advanced visualization and characterization techniques for the solid and porous microstructure of CLs. The solid and porous microstructure determines the transport and electrochemical phenomena in PEM fuel cells. The structure-determined transport coefficients and electrochemical properties of the CLs are comprehensively examined, and their relation with the structural parameters is reviewed. The inhomogeneous microstructure of CLs also affects the performance of PEM fuel cells, which further determined the degradation rates of the long-term performance. The relation among the microstructure, performance and durability is analyzed based on the literature studies. Finally, the challenges and future directions of the studies on the CL microstructure are explained.

Word count: 181