Catalyst evaluation for oxygen reduction reaction in concentrated phosphoric acid at elevated temperatures - DTU Orbit (24/08/2019)

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Phosphoric acid is the common electrolyte for high-temperature polymer electrolyte fuel cells (HT-PEMFCs) that have advantages such as enhanced CO tolerance and simplified heat and water management. The currently used rotating disk electrode technique is limited to tests in dilute solutions at low temperatures and hence is not suitable for catalyst evaluation for HT-PEMFCs. In this study, we have designed and constructed a half-cell setup to measure the intrinsic activities of catalysts towards the oxygen reduction reaction (ORR) in conditions close to HT-PEMFC cathodes. By optimization of the hydrophobic characteristics of electrodes and the catalyst layer thickness, ORR activities of typical Pt/C catalysts are successfully measured in concentrated phosphoric acid at temperatures above 100 °C. In terms of mass-specific activities, the catalyst exhibits about two times higher activity in the half-cell electrode than that observed in fuel cells, indicating the feasibility of the technique as well as the potential for further improvement of fuel cell electrode performance.

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