

State-of-the-art polymer electrolyte fuel cells (PEFC): The remaining research challenges

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Fuel cell technology has progressed significantly regarding performance and durability during the last decade. The remaining challenges will be discussed during this presentation. The presentation focuses on investigations of fuel cell durability and degradation at low Pt loadings. Major motivation is the need to reduce the amount of Pt in MEAs down to below $0.2 \text{ mg}_{\text{Pt}}/\text{cm}^2$ in order to make PEFC more competitive and sustainable. The particular challenge is to maintain high performance and long-term durability concurrently with the Pt loading reduction which are conflicting goals

In this context, a general problem is the lack of common procedures to reliably determine voltage loss rates in durability tests and to distinguished irreversible and reversible voltage losses. Regarding the influence of Pt loading on PEFC performance and durability our study shows that for cathode loadings below $0.2 \text{ mg}_{\text{Pt}}/\text{cm}^2$ and for current densities $>1 \text{ A}/\text{cm}^2$, a sudden increase of mass transport resistance is observed. The same threshold value is found for the increase of irreversible voltage losses. These results are discussed with respect to the electrode structure, in particular with respect to the ionomer in the electrode.

References:

[1] P. Gazdzicki, J. Mitzel, D. Garcia Sanchez, M. Schulze, K. A. Friedrich, J. Power Sources, 327, 85 (2016).