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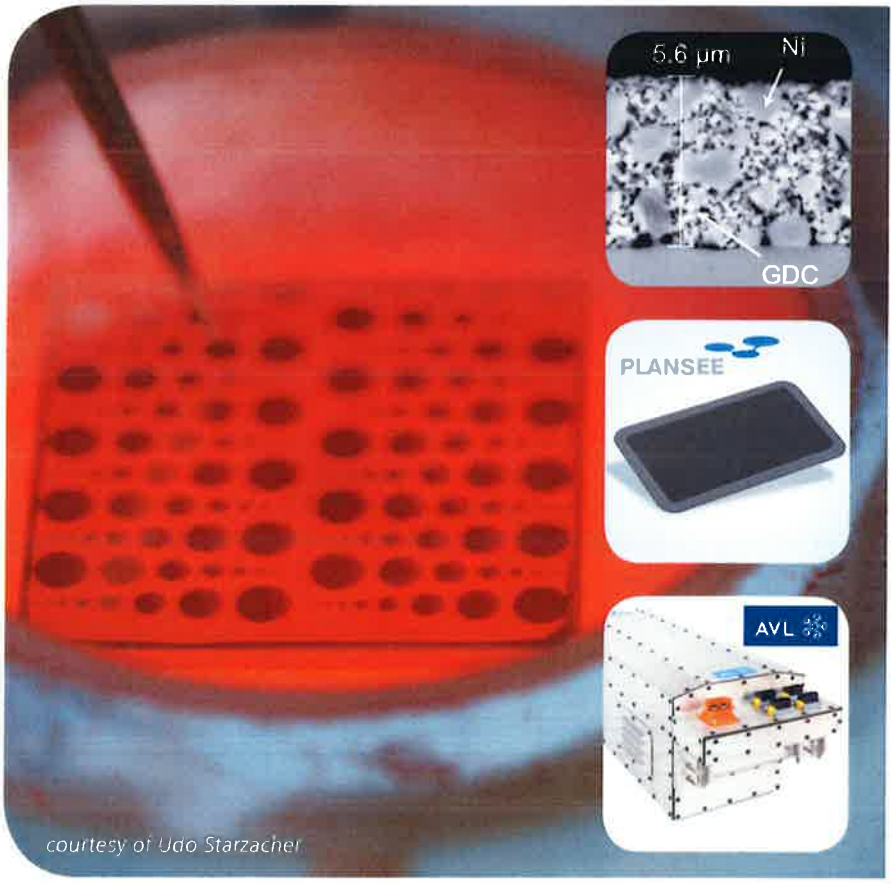

Improved Electrochemical Performance and Long-Term Stability of Metal-Supported Fuel Cells by Optimized Cell Processing

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Metal-supported solid oxide fuel cells (MSCs) are promising candidates for non-stationary fuel cell applications like auxiliary power units (APUs) in heavy duty trucks or range extender for battery electric vehicles due to their inherent mechanical stability, simplified sealing ability and high potential for cost reduction. Based on the Plansee MSC concept developed since 2008, the "Christian Doppler Laboratory for Interfaces in Metal-Supported Electrochemical Energy Converters" started in 2014 to contribute to the enhancement of electrochemical performance and long-term stability of the cells by optimized processing of the electrodes and tailoring of the interfaces. On the one hand, introduction of LSC instead of LSCF as cathode material combined with the adaption of particle size and sintering procedure was found to be an effective measure to fulfill these aims. For the fuel side electrode, replacing Ni/YSZ by Ni/GDC as anode material including a stepwise optimization of the microstructure by adjusting the sintering conditions resulted in another significant increase of cell performance, mainly based on enhancing the electrochemically active area. Furthermore, improving the surface quality of the anode layers enabled to reduce the electrolyte thickness, which further improved cell performance. Moreover, the MSC cell type also offers novel possibilities for the internal reforming of hydrocarbons by catalytic activation of the metallic substrate. In order to understand MSC specific degradation mechanisms, detailed investigations about the redox stability of the anode, the oxidation behavior of the metallic substrate, interdiffusion between the interfaces and chromium based ageing of the cathode material were performed. The presentation summarizes the recent results achieved in the project including a general discussion of factors which must be considered for further increasing of cell performance and ensuring long-term stability.