# Electrophoretic deposition of alumina protective layer for innovative interface concepts between metallic interconnect and glass sealing in solid oxide electrolysis cell

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Improving the stability of the interface between the metallic interconnect and the glass-based sealing is one of the key factors to enable the development of highly performing Solid Oxide Cell stacks. The application of an alumina-based protective coating is a viable solution for the modification of interconnect surface, to enhance the mechanical performance of the interconnect-sealing interface (i. e. for pressurised operation) and limit possible detrimental reactions during the long-term operation of the stack. An innovative aluminization process achieved by electrophoretic deposition (EPD) of aluminium precursors on Crofer22APU stainless steel is here presented and discussed. The obtained alumina layer results in increased surface roughness of the Crofer22APU steel substrate, allowing a proper tuning of the interfacial properties. Alumina-coated Crofer22APU tested in dual atmosphere Solid Oxide Electrolysis Cell operating conditions at 850 °C demonstrates enhanced performance compared to the unmodified steel substrate. The evidence proves the effectiveness of the obtained alumina layer in limiting the formation of chromates and avoiding detrimental interfacial reactions at the interface with the Crofer22APU.
An approximate 25% increase in torsional shear strength is found for alumina-coated steel/glass sealant system compared to the unmodified steel substrate: the deposition of alumina-based coating strengthens the steel/sealant interface leading to a cohesive failure of the joint.

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