Electron microscopy investigation of electrochemically enabled wetting of Y stabilized zirconia on Ni

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Introduction

Solid oxide fuel cell (SOFC) and solid oxide electrolysis cell (SOEC) technologies are key fields of research and development at DTU Energy Conversion. In both SOFC and SOEC cells nickel and doped zirconia are fundamental materials in the fuel electrodes, chosen for their materials properties and for the fact that they normally do not interact. In particular, it has been thought that nickel and zirconia do not wet each other, but quite unexpectedly we discovered how to unlock wettability in these materials, while studying the degradation process of SOEC-cells.

Results and discussion

High resolution TEM study revealed that the mismatch between the lattice of the cubic zirconia nano particles and that of Ni grains was within 3 %, and that an epitaxial relationship was formed between the new yttrium containing zirconia nano particles and the micrometer-scale Ni grains [2]. This can effectively reduce the interfacial energy and promote wettability.

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References


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