# Electrical properties of yttria-stabilized zirconia / nickel oxide composites prepared by a liquid mixture technique

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**Abstract**

We report the preparation and characterization of yttria-stabilized zirconia/nickel oxide composites (YSZ/NiO). This composite is the precursor material for the cermet YSZ/Ni, which is used as solid oxide fuel cell (SOFC) anode after the reduction of the NiO through heat treatment in a hydrogen containing atmosphere. The performance of the anode material is strongly dependent on the microstructural properties of the cermet and a high density of triple phase boundaries for the catalytic reaction of the hydrogen in the SOFC anodes is desirable. Therefore, the control of the microstructure of the YSZ/NiO composite is a key step for the fabrication of high-performance anode cermets. In this study, the

composites were prepared by a modified liquid mixture technique in the concentration range of 0-75 mol % of NiO, followed by calcination at 450 °C. The powders were investigated by scanning electron microscopy and X-ray diffraction analysis, which evidenced the good dispersion of the phases and that NiO nanoparticles are spread over the YSZ surface. Dense pellets sintered at 1350 °C were studied by X-ray diffraction and electrochemical impedance spectroscopy in the 100-800 °C temperature range. The main results show that the composite is comprised of a well-dispersed mixture of the two phases, and no solubilization of the NiO into YSZ structure was detected. The electrical conductivity data show that there is a strong dependence of the transport mechanism on the relative composition of phases.

Keywords: mixed conductor, composite, electrical properties

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