TUESDAY, AUGUST 23, 2005, P.M.

SESSION 23A: INTERNATIONAL SYMPOSIUM ON FUEL CELL AND HYDROGEN TECHNOLOGIES

SOFC ELECTROLYTE & INTERCONNECT
Sponsor(s): Materials Science and Engineering Section, The Metallurgical Society of CIM
Room: Imperial Ballroom 7
Chairmen: X. ZHANG, NRC Institute for Fuel Cell Innovation, Canada and
O. KESLER, University of British Columbia, Canada

PAPER 23A.1 — 14:00
SOLID OXIDE FUEL CELLS WITH SAMARIA-DOPED CERIA ELECTROLYTES PREPARED VIA SPRAY PYROLYSIS.
D. PEREDNIS, Y. XIE and D GHOSH, NRC Institute for Fuel Cell Innovation, Canada

Fuel cells utilizing thin samaria-doped ceria (SDC) electrolyte films deposited onto an anode support using spray pyrolysis were tested. The SDC films were deposited onto porous NiO-YSZ substrates at deposition temperatures between 400°C and 450°C. The influence of process parameters such as deposition temperature and salt concentration on film morphology was studied. A smooth dense film was successfully deposited using the precursor cerium nitrate and samarium nitrate dissolved in butyl carbitol (33.3 vol.%), 2-methoxy-1-propanol (33.3 vol.%), and ethanol (33.3 vol.%) solvent mixture.

PAPER 23A.2 — 14:20
STUDYING METALLIC INTERCONNECT OXIDATION IN SOLID OXIDE FUEL CELL APPLICATION ANALYTICAL TOOLS AND TECHNIQUES.
I. PROTKOVA and S. BENHADDAD, Versa Power Systems, Canada

Versa Power Systems SOFC stacks operate at intermediate temperatures 700 to 800°C allowing the use of metallic interconnects. Thermal expansion good matching with other stack components and cost restriction led to selecting ferritic stainless steels as interconnect material. Analytical tools and techniques were developed to understand the ferritic stainless steel behavior at high temperature while exposed to dual environment. Analytical tools such as XRD, SEM and EDS have provided valuable information towards describing interconnect degradation in a variety of testing conditions. Several examples are presented to demonstrate interconnect oxidation and its relation with SOFC testing results.

PAPER 23A.3 — 14:40
MATERIALS DEVELOPMENTS FOR SOLID OXIDE FUEL CELLS BASED ON PEROVSKITE-TYPE STRUCTURE.
V. THANGADURAI and W. WEPPNER, University of Calgary, Canada

The invention of fast oxide ion conductivity in the perovskite-like (Sr+Mg) doped $LaGaO_3$ oxides has drawn much attention in the recent years due to its high ionic conductivity over a wide range of oxygen partial pressures (1). The highest bulk ionic conductivity of 0.17 S/cm at 800°C has been reported for x = 0.2 and y = 0.17 in the chemical composition series $La_{1-x}Sr_xGa_{1-y}Mg_yO_{3-\delta}$ (LSGM), which is about four times higher than that of presently used oxide ion electrolyte Y_2O_3 stabilized ZrO_2 (YSZ) in the solid oxide fuel cells (2). Accordingly, LSGM based materials are considered as a potential candidate for intermediate temperature solid oxide fuel cell (IT-SOFC) applications (3). The LSGM was investigated in detail with regard to the crystal structure, electrical conductivity, chemical compatibility with electrodes and stability under fuel cell conditions. In this talk, the recent advances in the perovskite-type structured solid oxide ion electrolytes will be presented.

PAPER 23A.4 — 15:00
SAMARIUM DOPED $SrCoO_{3-\delta}$ CATHODE CERAMICS FOR USE IN INTERMEDIATE TEMPERATURE SOFCS.
A.C HATTON, M.D.VLAJIC, Z. YU and V.D.KRSTIC, Queen's University, Canada

Doped $SrCoO_{3-\delta}$ was found to be a promising material for use as a cathode component in intermediate temperature SOFCs. In this work, strontium cobaltite ceramics doped with 10 mol% to 90 mol% samarium were synthesized using the glycine nitrate process in order to study the electrical conductivity and thermal expansion at temperatures of up to 800^{o}C. As-synthesized powders were deagglomerated, pressed and sintered at temperatures ranging from 1100-1250^{o}C. The effect of temperature and composition on electrical conductivity and thermal expansion are presented and discussed.

PAPER 23A.5 — 15:20

NI-YSZ CERMET SUBSTRATE SUPPORTED THIN SDC AND YSZ-SDC AND YSZ+SDC BI-LAYER SOFC'S.

X. ZHANG, M. ROBERTSON, C. DECÈS-PETIT, Y. XIE, R. HUI, R. MARIC and D. GHOSH, NRC Institute for Fuel Cell Innovation, Canada

Thin electrolyte of two types: SDC (20μm) one-layer and YSZ(5μm) + SDC (15μm) bilayer SOFCs were fabricated by screen printing and cofiring on Ni-YSZ cermet substrate. Many Zr-content micro-islands were found on the thin SDC surface. We investigated the influence of cofiring temperature, solid loading of anode and electrolyte ink on the Zr-islands appearance. Cell performance shows the thin SDC cell has higher maximum power density at low temperature range than that of a bilayer cell, while the bilayer cell shows reasonable performance at 700-800°C with almost theoretical OCV value.

COFFEE BREAK — 15:40 – 16:00