STRUCTURE AND CONDUCTIVITY OF A Yb-DOPED $SrCeO_3$-$BaZrO_3$ SOLID SOLUTION

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Hydrogen ion transport processes in electrolytes ve hitherto been principally associated with polymeric terials as used in PEFC devices. However in recent ırs there has been increasing attention given to the responding electroceramic electrolytes; in particular eral perovskite cerates and zirconates have been ognized as high conductivity hydrogen ion or "proton"- ısport materials. Solid oxide fuel cells based on these terials could have the advantage that the oxidation duct, water vapor, is discharged at the cathode (air) e, unlike the oxide ion devices based on zirconium, ere it dilutes the fuel at the anode side and thereby uces the local Nernstian potential. With the protonic ctrolyte therefore a more uniform current density, and refore temperature profile, could be maintained over cell area, a possible advantage for system design and ability. There is also a higher ionic conductivity at uced temperatures than is typical of oxide conductors. ne protonic electrolytes, particularly perovskite cerate-ed solid solutions, are known to have a significant ıductivity at temperatures in the range 400 to 600°C . Current research addresses the utility of such terials for fuel cells, sensors, hydrogen separation mbranes, and catalysis [2]. They are not restricted to use of hydrogen as fuel [3]. While the cerates have the hest proton conductivities [1,4], zirconates [4,5] are ticularly stable, especially in contact with carbon xide.

This work describes the chemical synthesis of Yb-doped $SrCeO_3$-$BaZrO_3$ solid solution, and its ect on compositional homogeneity and chemical bility. The $Ba_{0.5}Sr_{0.5}Ce_{0.475}Zr_{0.475}Yb_{0.05}O_{2.975}$ nposition is chosen because there is an equimolar xture of $SrCe_{0.95}Yb_{0.05}O_{2.975}$ and $BaZr_{0.95}Yb_{0.05}O_{2.975}$. us, it will be possible to study the effect of an average icity of the lattice oxygen (average value between $Ce_{0.95}Yb_{0.05}O_{2.975}$ and $BaZr_{0.95}Yb_{0.05}O_{2.975}$ basicities) and effect of Sr/Ba mixing on the A-site on the proton ıductivity and the chemical stability.

The characterization methods included x-ray fraction, dilatometry, thermal analysis methods and of ırse the electrochemical study of the transport perties. The structure is influenced by the presence of ytterbium dopant With electrochemical methods a endance of conductivity on the gas environment is ablished. At lower temperatures the hydrogen fuel uires an admixture of water vapor to achieve ximum conductivity. However an oxygen ionic ısport component is also observed in a hydrogen-free ıydrous environment, the conductivity being an order magnitude lower than when protons are available.. At vated temperatures and associated with a mass loss, the ıductivity tends towards that for oxygen transport ne.

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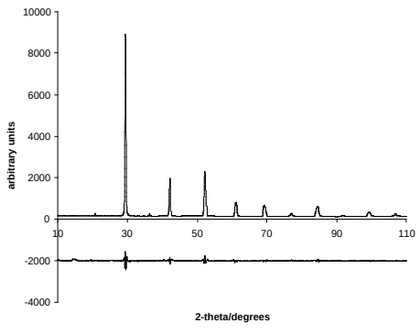

Fig. 1: X-ray diffraction pattern for the ytterbium-doped solid solution

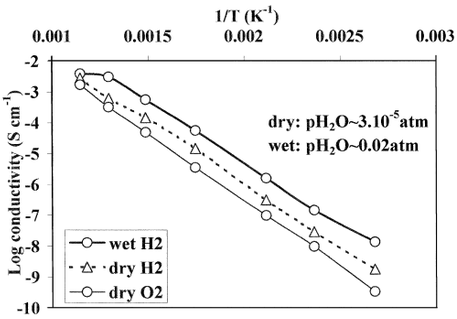

Fig. 2: Conductivity dependence on temperature and gas environment.

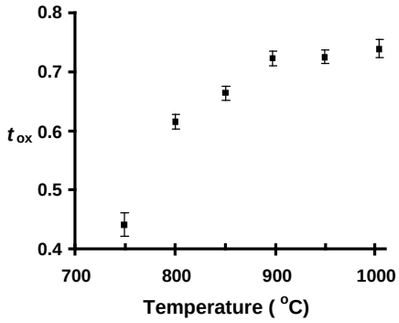

Fig. 3: oxygen transport number increases rapidly above 750°C.

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