Solid Oxide Fuel Cells: Materials Concept for Single Element Arrangements (SEAs) Cells

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Solid oxide fuel cells (SOFCs) generates electricity by electrochemical reaction using hydrogen (or hydrocarbon or CO) and oxygen. Several transition metal oxides possessing fluorite, pyrochlore, perovskite and related structure materials have been explored as an electrolyte for SOFCs (1). Present state-of-art of the development of SOFCs will be discussed and major problems in the present materials are considered very briefly. A new concept for the development of modern SOFC based on the single element arrangements (SEAs) will be presented (2). A typical material for SEA will be demonstrated based on the ABO_3 (A = Ca, Sr, B = Sn) perovskite-type structure oxides. A typical example will be shown by substitution of Fe for Sn in $SrSnO_3$ (3). Several transition metal ion where substituted for Sn in $SrSnO_3$. All the oxide materials were prepared by solid state reactions at elevated temperature. The synthesized oxides were characterized by powder XRD, TGA and AC impedance.

Stability of the developed perovskite type materials under the fuel cell operating conditions will be investigated. An optimized composition with high ionic conductivity with good structural stability under the fuel cell operation condition will be employed in SEAs and results will be presented.

Reference

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