INFLUENCE OF CONTAMINATED GAS ON THE $(La_{1-X}Sr_X)_YBO_{3-\delta}$ (B = Co, Fe) OXYGEN ELECTRODE BY ELECTROCHEMICAL *IN-SITU* XRD AND THERMOGRAVIMETRIC ANALYSIS METHOD

Alar Heinsaar[a], Indrek Kivi[a], Gunnar Nurk[a], Jaan Aruväli[b], and Enn Lust[a]

[a] *Institute of Chemistry, University of Tartu, Estonia*
[b] *Institute of Ecology and Earth Sciences, University of Tartu, Estonia*
Estonia, Tartu, Ravila 14a
alar.heinsaar@ut.ee

$(La_{1-x}Sr_x)_yBO_{3-\delta}$ (B = Co, Fe) electrode is an excellent mixed electron and ionic conductor in the solid oxide fuel cells (SOFC) oxygen electrode group [1, 2]. Increasing interest in the operation of SOFCs at temperatures considerably lower than 1200 K, has raised the need for fundamental studies for a better understanding of the factors determining limiting processes for oxygen reduction reaction at oxygen electrode side.

The SOFC symmetrical cells with porous $(La_{1-x}Sr_x)_yBO_{3-\delta}$ (B = Co, Fe) electrodes for intermediate temperature applications have been studied under electrochemical polarization and synthetic air + H_2O vapor (so called moisturized oxygen electrode gas) feeding conditions using high-temperature electrochemical *in-situ* X-ray diffraction method and impedance spectroscopy methods. Changes in the lattice parameters and electrochemical activity of the cathode were calculated depending on the temperature (*T*), electrode potential (*E*), and oxygen partial pressure (*pO2*) applied. Synthesized electrode powders have been processed under CO_2 environment to study formation of carbonates with thermogravimetric analysis (TGA).

Detailed comparison of experimental data demonstrates that the electrocatalytic activity of the cathode decreases with increasing Fe cation substitution into the B site. Oxygen electrode activity also decreased with moisture in electrode gas. For the slightly cationic deficient in A position $(La_{0.6}Sr_{0.4})_{0.99}CoO_{3-\delta}$ shows that, the electrode structure is more stable and the electroreduction of the oxygen was higher, compared with other studied materials.

References

1. S.C. Singhal, K. Kendall (Eds.), *High-Temperature Solid Oxide Fuel Cells: Fundamentals, Design and Applications*, Elsevier, Oxford, 2003
2. A. Weber, E. Ivers-Tiffée, *J. Power Sources 127* (2004) 273

Euroopa Liit
Euroopa
Regionaalarengu Fond

Eesti
tuleviku heaks