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Studies of structural, microstructural, electrical and magnetic properties of $REFeO_3$ (RE = Gd, Eu, Sm)

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Abstract – In this work we present structural, microstructural, electrical and magnetic studies on $REFeO_3$ (RE = Gd, Eu, Sm) perovskite produced by solid-state reaction. X-ray diffractograms reveal that the samples have single phase, and the Scanning Electron Microscopy (SEM) analysis shows their porous surface, with grains of lateral dimension of approximately 1 μm. The measurements of resistivity in atmosphere indicate that these specimens can be used as chemical sensor, in especial as a sensor of gasoline. Studies of resistivity and magnetization as function of temperature and magnetic field are also shown.

ABO_3 perovskite type ceramics are widely used in technological applications, due to its electrical, magnetic and optical properties [1]. When A is an element rare earth and B is a transition metal these materials has been used as chemical sensors. Sensor based in nanometric materials $REFeO_3$ (RE = Eu and Gd) have shown a satisfactory sensitivity and selectivity for various gases, especially gasoline [2]. Sensors based on $SmFeO_3$ show a large increase in electrical conductivity with increasing temperature, when subjected to different gaseous atmospheres [3].

The samples were prepared by solid-state reaction method, in which oxides of elements (Gd_2O_3, Eu_2O_3, Sm_2O_3 and Fe_2O_3) with high purity are mixed and carry to thermal treatment. The sintering process was carried out with the precursor material in the form of powder and pellet, and the temperature varying between 500 - 1200ºC for different intervals of time, 1, 6, 12 and 24 hours.

The obtained specimens were characterized structural and microstructural by X-rays diffraction (Fig.1) and SEM (Fig.2). The X-rays diffractograms showed that the samples present a single phase. SEM analysis revealed the surface porous and uniform of the studied materials. In concordance with the X-rays diffractograms, Energy Dispersive Spectrometry (EDS) analysis didn't reveal the presence of impurity. Measurements of resistivity as a function of temperature (Fig.3), using the four-probe method, and atmosphere were performed in a home built apparatus. As result, it was verified that all samples exhibited ohmic behavior. The magnetic measurements will be conducted using a MPMS magnetometer by Quantum Design via measurements of DC magnetization *vs.* temperature and magnetic field.

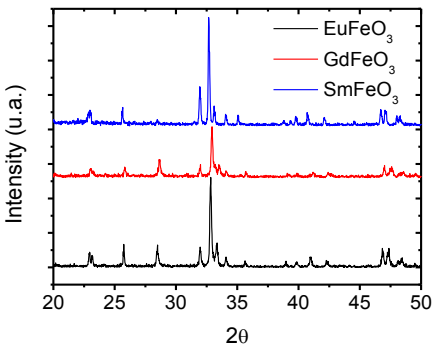

Fig. 1 - X-rays diffractogram for the different studied samples.

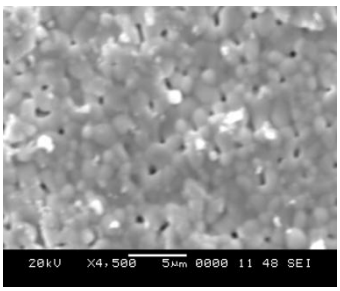

Fig. 2 – SEM for the $SmFeO_3$ sample treated at 1200 ^{o}C for 6 h.

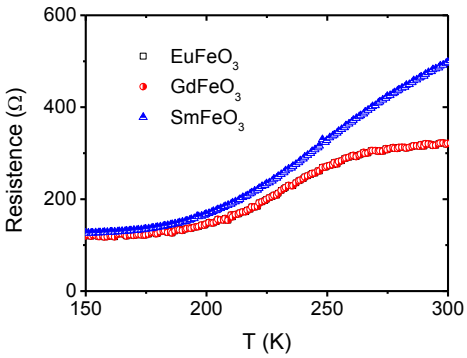

Fig. 3 - Resistance vs. temperature.

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References:

[1] N.Q. Minh, Ceramic full cells, J. Am. Ceram. Soc. **76**, 563 (1993).
[2] X. Niu, W. Du and W. Du, Sensors and Actuators B **99**, 399 (2004).
[3] H. Aono, M. Sato, E. Traversa, M. Sakamoto and Y. Sadaoka, J. Am. Ceram. Soc. **84**, 341 (2001).