

## Influence of Fe<sup>3+</sup> doping in the crystallization behavior of SrSnO<sub>3</sub> perovskite

F. T. G. Vieira<sup>(1)\*</sup>, S. C. Souza<sup>(1)</sup>, E. Longo<sup>(2)</sup>, S. J. G. Lima<sup>(3)</sup>, T. A. Passos<sup>(3)</sup>, A. G. Souza<sup>(1)</sup> and I. M. G. Santos<sup>(1)</sup>

(1) LACOM/ DQ/ Universidade Federal da Paraíba, João Pessoa, PB, Brazil. E-mail: fagnerticiano@yahoo.com.br

(2) CMDMC/Instituto de Química/ Universidade Estadual Paulista, Araraquara, SP, Brazil.

(3) LSR/DTM/ Universidade Federal da Paraíba, João Pessoa, PB, Brazil.

\* Corresponding author.

**Abstract** – Alkaline earth stannates doped with Fe<sup>3+</sup> were synthesized by the polymeric precursor method. Characterization was done by X-ray diffraction, infrared spectroscopy and UV-vis spectroscopy. Results confirmed the formation of the SrSnO<sub>3</sub> with orthorhombic perovskite structure, besides secondary phases as SnO<sub>2</sub> and SrCO<sub>3</sub>. Synthesis temperature was lower than materials obtained by solid state reaction. When Fe<sup>3+</sup> replaced Sn<sup>4+</sup>, a lower amount of strontium carbonate was formed. A higher crystallinity was observed for these samples.

Alkaline earth stannates have recently become important materials in ceramic technology due to their wide application in many catalytic reactions. Perovskite oxides (SrSnO<sub>3</sub>: Fe) have been previously synthesized using the solid state reaction, with a temperature treatment above 1000 °C/ 24 h [1]. In the present investigation the systems Sr<sub>0.80</sub>Fe<sub>0.20</sub>SnO<sub>3</sub>, SrSn<sub>0.8</sub>Fe<sub>0.20</sub>O<sub>3</sub> and Sr<sub>0.90</sub>Fe<sub>0.10</sub>Sn<sub>0.90</sub>Fe<sub>0.10</sub>O<sub>3</sub> were synthesized by the polymeric precursor method. Samples were characterized by X-ray diffraction, infrared and UV-vis spectroscopy.

Infrared spectra are presented in Fig. 1. According to Perry et al [2], four vibration modes are present in perovskite infrared spectra:  $\nu_1$  is assigned to the stretch vibration of Me-O bond;  $\nu_2$  is an optically inactive mode of the stannate group (SnO<sub>3</sub><sup>2-</sup>), which becomes active on account of distortions of the crystal lattice from ideal cubic structure;  $\nu_3$  is assigned to a stretching and bending mode of O-Sn-O;  $\nu_4$  is the only mode which depends on the modifier cation. In the present work,  $\nu_1$  and  $\nu_3$  modes were observed at 670 e 400 cm<sup>-1</sup>, respectively.  $\nu_2$  mode was observed at about 540 cm<sup>-1</sup>, with higher intensity for Sr<sub>0.80</sub>Fe<sub>0.20</sub>SnO<sub>3</sub> sample, indicating that this samples had a higher short range disorder, probably due to Fe<sup>3+</sup> covalent character, which distorted the perovskite structure. According to Nyquist and Kagel [3], carbonate bands are located at 1320-1530, 1040-1100 and 800-900 cm<sup>-1</sup>, which were observed in all samples in the present work. The highest amount of carbonate was observed in Sr<sub>0.80</sub>Fe<sub>0.20</sub>SnO<sub>3</sub> sample.

XRD patterns (Fig. 2) showed the formation of perovskite phase in all samples. A low crystallinity was observed for Sr<sub>0.80</sub>Fe<sub>0.20</sub>SnO<sub>3</sub>, in agreement to infrared spectra, that indicated a higher short range disorder for this sample. A higher crystallinity was observed in the other samples, with peaks of higher intensity and smaller width, besides less intense  $\nu_2$  mode in the infrared spectra. SrCO<sub>3</sub> was observed in all samples, while SnO<sub>2</sub> was observed when Sn<sup>4+</sup> was replaced in the perovskite lattice.

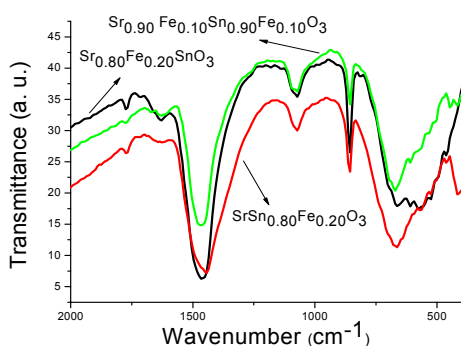


Figure 1: Infrared spectra of perovskites calcined at 800 °C for 4 h.

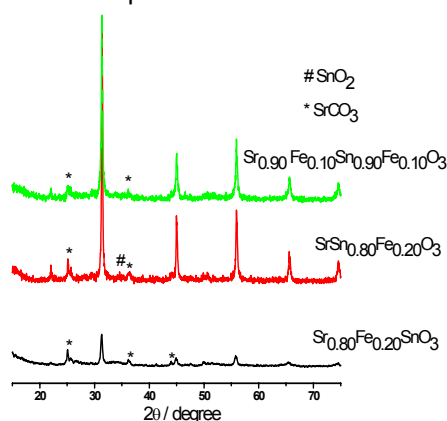


Figure 2: XRD patterns of perovskites calcined at 800 °C for 4 h.

Acknowledgements: The authors acknowledge the financial support of CNPq/MCT and FINEP/MCT.

### References

- [1] P. S. Beurmann, V. Thangadurai and W. Weppner, J. Solid State Chem. 174 (2003) 392-402.
- [2] C. H. Perry, D. J. McCarthy and G. Rupprecht, Phys. Rev. A 138 5A (1965) 1537- 1538.
- [3] R. Nyquist and R. Kagel, Infrared Spectra of Inorganic Compounds. London: AcademicPress; 1971.