**Ceramic processed by laser floating zone for thermoelectric applications**

**N.M. Ferreira1, M.A. Madre2, A. Sotelo2, A.V Kovalevsky3, F.M. Costa1**

1 i3N, Physics Department, Department of Materials and Ceramic Engineering, Universidade de Aveiro, Portugal or Division Name, Organisation/Affiliation, City, State, Country.

2 ICMA (CSIC-Universidad de Zaragoza), C/Maria de Luna 3, 50018 Zaragoza, Spain

3 CICECO - Aveiro Institute of Materials, Department of Materials and Ceramic Engineering, Universidade de Aveiro, Portugal.

**Abstract:**

Near 70% of our useful energy is lost as waste heat, for this reason efficiency in electricity production and application are issues, that has been the topic of many investigations in recent years. Relevance is been given to the development and production of possible solutions to recovered that heat waste. Thermoelectric materials (TE) can reuse this lost energy, converting it into electricity. Traditional thermoelectric materials, despite their good performance, present problems, such toxicity/scarcity of the elements used and their stability in harsher work conditions like high temperatures or non-inert atmospheres. Thermoelectric oxides, based on ceramics appear to be a promising alternative due to abundance of the constituents and high thermal stability. This work focuses on the processing of these materials using the Laser Floating Zone (LFZ) technique. Particular emphasis is given to LFZ processing under magnetic field, allowing unique opportunities for tuning the structural, microstructural and thermoelectric properties. This technique allows the growth of fully dense fibres, as well as the formation of metastable phases and/or promoting different oxidation states by adjusting the growth conditions. We report the processing of model calcium manganite -based materials including different donor-substituted systems. The results suggest the successful incorporation of the dopants in the structures of the base material. The results demonstrate some guidelines for tuning the phase composition and microstructure by adjusting the growth conditions. The results show also the effect of the magnetic field used, produces different effects in the phases formed and thus the thermoelectric performance of the samples, which allows a potential phase tuning of these materials. The obtained guidelines suggest that LFZ is a suitable technique for processing thermoelectric oxides, if optimized control over growth parameters and re-equilibration conditions is imposed.

**Biography of presenting author**

Nuno Ferreira, is a PhD in Physics Engineering (2014), currently is a researcher at i3N, Physics Department at University of Aveiro, Portugal. He had participated in several R&D projects on material science, as experience researcher in the study and development of ceramics-based materials, prepared through conventional methods and particular focus on laser processing. Present sample preparation and characterization skills include various techniques such as electrical conductivity and magnetic properties of various oxide materials. Current focus materials: thermoelectrics, ferroelectrics and glass matrices doped with transition metals and rare earth for energy applications of storage and conversion.

**Details of presenting author invited to be mentioned in the certificate:**

Name: Nuno Ferreira

Affiliation: i3N & Department of Physics, Aveiro University

Country: Portugal

**Other Details:**

Presentation Category: oral invited

Session Name:

Email: nmferreira@ua.pt

Alternative email:

Contact Number:

Twitter/Facebook/LinkedIn: <http://www.i3n.org/Person.aspx?id=186>, <https://pt.linkedin.com/in/nferreira2007>

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