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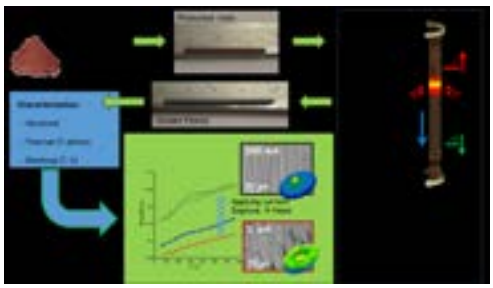
Thermoelectric oxides processed by a laser floating zone technique

N.M. Ferreira[1], S. Rasekh[2], A.V Kovalevsky[3], F.M. Costa[4], M.A. Madre[5], J.C. Diez[6] and **A. Sotelo[7]**
[1,2,3,4]Universidade de Aveiro, Portugal
[5,6,7]CSIC-Universidad de Zaragoza, Spain

Oxide ceramics are very promising materials for new thermoelectric devices, as they exhibit high Seebeck coefficient and could present relatively low electrical resistivity, as well as high chemical stability at high temperatures. They show anisotropic thermoelectric properties linked to their layered structures. Therefore, texturing methods developing oriented grains, such as grain growth processes have already shown their applicability to this kind and similar compounds. Among these methods, the laser floating zone (LFZ) melting technique has been found to be very promising to tune up the performances of these compounds, especially in the Co-oxide based materials studied in the last years in our laboratories. In this work, some examples highlighting the versatility and usefulness of LFZ technique and the improvements on the thermoelectric performances of textured materials will be shown. This technique allows obtaining very dense, and well textured thermoelectric composite materials. In spite of the well-known incongruent solidification of this family of materials, the as-grown samples possess high thermoelectric properties which can be further enhanced by an adequate annealing procedure, leading to nearly single phase materials. These microstructural modifications produce an important improvement of power factor when compared with materials prepared through conventional techniques. Moreover, this processing technique also shows good prospects to be applied in modules construction.



Biography

Nuno Ferreira a PhD (2014) in Physics Engineering, nowadays, a pos-doc researcher at i3N, Physics Department and CICECO – Materials science and Ceramics Department at Aveiro University – Portugal. Had participated as collaborator and fellowship in several R&D projects on material science. Experience on study and development of ceramic based materials prepared through conventional methods (melting, solid stated) and focus in laser processing (crystal growth – LFZ and surface sintering). Present sample characterization skills on different 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 storage and conversion applications. Main expertise is related to magnetic and electrical properties of materials and laser processing.

nmferreira@ua.pt

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