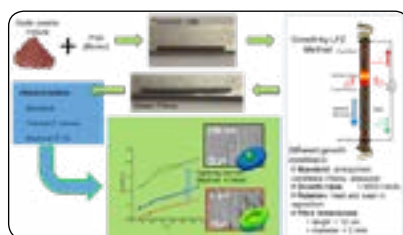


Laser processing of thermoelectric oxidesN M Ferreira¹, M A Madre², A Sotelo², A V Kovalevsky¹ and F M Costa¹¹Universidade de Aveiro, Portugal²ICMA, CSIC-Universidad de Zaragoza, Spain

Ceramic oxides are very promising materials for thermoelectric devices, as they exhibit high Seebeck coefficient and could present relatively low electrical resistivity, as well as high chemical stability at high temperatures. Several oxides exhibit anisotropic thermoelectric properties linked to their layered structures. Therefore, texturing methods developing a preferential grain orientation, like the directional growth from the melt, are suitable to enhance the relevant physical properties. These methods have already shown their applicability to this kind of compounds and also in high T_c superconductor materials, namely, through the use of laser floating zone (LFZ) technique. The LFZ process has demonstrated its suitability for the Co-oxide based thermoelectric materials, processed in the last years in our laboratories. In this work, some examples of the versatility and usefulness of the LFZ technique are shown. The LFZ technique allows obtaining very dense, homogeneous and well textured thermoelectric composites. The results put in evidence an improvement due to electrically assisted laser floating zone on the thermoelectric performances when compared with materials processed by LFZ and by conventional techniques.

**Recent Publications**

1. A V Kovalevsky, A Myriam, S Populoh, S Patrício, N M Ferreira, S Mikhalev, D Fagg, A Weidenkaff and J R Frade (2016) Designing strontium titanate-based thermo electrics: An insight into defect chemistry mechanisms. *Journal of Materials Chemistry A* 5:3909-3922.
2. A Sotelo, F M Costa, N M Ferreira, A Kovalevsky, M C Ferro, V S Amaral, J S Amaral, S Rasekh, M A Torres, M A Madre and J C Diez (2016) Tailoring $\text{Ca}_3\text{Co}_4\text{O}_9$ microstructure and performances using a transient liquid phase sintering additive. *Journal of the European Ceramic Society* 36(4):1025-1032.
3. M A Madre, F M Costa, N M Ferreira, S I R Costa, S Rasekh, M A Torres, J C Diez, V S Amaral, J S Amaral and A Sotelo (2016) High thermoelectric performance in $\text{Bi}_{2-x}\text{Pb}_x\text{Ba}_2\text{CO}_2\text{O}_x$ promoted by directional growth and annealing. *Journal of the European Ceramic Society* 36(1):67-74.
4. Rasekh, F M Costa, N M Ferreira, M A Torres, M A Madre, J C Diez and A Sotelo (2015) Use of laser technology to produce high thermoelectric performances in $\text{Bi}_2\text{Sr}_2\text{Co}_{1.8}\text{O}_x$. *Materials and Design* 75:143-148.
5. F M Costa, N M Ferreira, S Rasekh, A J S Fernandes, M A Torres, M A Madre, J C Diez and A Sotelo (2015) Very large superconducting currents induced by growth tailoring. *Crystal Growth and Design* 15(5):2094-2101.

Biography

N M Ferreira is a PhD in Physics Engineering (2014), currently is a Post-Doc Researcher at i3N, Physics Department and CICECO, Department of Materials and Ceramic Engineering at University of Aveiro, Portugal. He participated as a collaborator and research fellow in several R&D projects on material science. He is an experienced researcher in study and development of ceramics-based materials, prepared through conventional methods (melting, solid stated), with particular focus on laser processing (crystal growth – LFZ and surface sintering). Present sample 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 storage and conversion applications. Main expertise is related to structural, magnetic and electrical properties of materials prepared by laser processing.

nmferreira@ua.pt