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Transport properties on nanostructured oxides: Grain boundary effects

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The presence of interfaces and grain boundaries in ceramics materials affects both thermal diffusion and charge transport among others properties. However, these effects are not completely understood and more efforts from a theoretical and from an experimental point of view must be addressed. Here, we report on the grain boundary and size effects on thermal, electric and thermoelectric properties of different ceramic oxides obtained by mechanical alloying or milling. We will discuss these effects on the ionic conductivity of YSZ, which is extensively used as electrolyte in SOFC, by complex impedance measurements. Our results are discussed in terms of the presence or absence of an space charge layer along boundaries. Regarding the thermal transport, it's shown an strong depression of the thermal conductivity due to the presence of boundaries in nanocomposites of YSZ/STO among others oxides materials. This effect is interpreted in terms of an strong enhancement of the phonon scattering at grain boundaries. Finally we present the interesting behaviour of the thermoelectric properties of cobalt oxides due to the effect of the grain size reduction. The influence of the grain size on the thermoelectric figure of merit (ZT) and the compromise between electrical and thermal transport in cobalt oxides will be discussed.

Biography

O J Dura completed his PhD in 2009 from University of Castilla-La Mancha. Then he pursued Post-doctoral at Technical University of Vienna and University Complutense de Madrid. Actually, he is Lecturer at the Applied Physics department of Castilla-La Mancha. His research interest focuses on transport properties and synthesis of nanostructured ceramic materials.

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