The effect of transition metal ions on the grain boundary resistivity of microcrystalline gadolinium doped ceria

**Objectives**
- To test the possibility of manipulating the core charge of the grain boundaries in ceria by exclusively introducing transition metal ions and by doing so, to eventually find a way to reduce the grain boundary resistivity of ceria electrolytes.

**Postulate**
- Transition metal oxides (TMO) have been used as sintering aids and for SiO2 scavenging in the synthesis of ceria-based ceramics [3,4]. Due to their low solubility, TMs almost exclusively segregate into the grain boundary core.

**Characterization of the samples**
- Estimated density of pellets: > 94% (Archimedes method).
- Average grain size: 17 to 39 µm (see Fig. 2a).
- Grain boundaries were free of amorphous phases such as silicate (see Fig. 2b).
- Electrical characterization by impedance spectroscopy.

**Results**
- Reaction plots for the bulk and grain boundary resistivities of the Ce0.99 Gd0.01 O2-x samples under O2.

**Hypothesis**
- Substitution of Ce ions by TM ions in the grain boundary core.

**Work in progress**
- Chemical analysis of the samples, determination of oxidation states of the TMs by EELS, mapping of the concentration of TMs in the grain boundaries.

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References


Website: <http://www.chms.ucdavis.edu/research/web/kim/>