Experimental Report

15/01/2014

Proposal: **1-04-74** **Council:** 4/2012

Title: Local structure of densified nanocrystalline Y-doped ceria

This proposal is a new proposal

Researh Area: Materials

Main proposer: **DAPIAGGI Monica**

Experimental Team: DAPIAGGI Monica
BRUNELLI Michela
BERNASCONI Andrea

Local Contact: BRUNELLI Michela

Samples: CeO2 + Y (from 2 to 30% in atoms)

Instrument	Req. Days	All. Days	From	To
D4	4	2	08/07/2013	12/07/2013

Abstract:

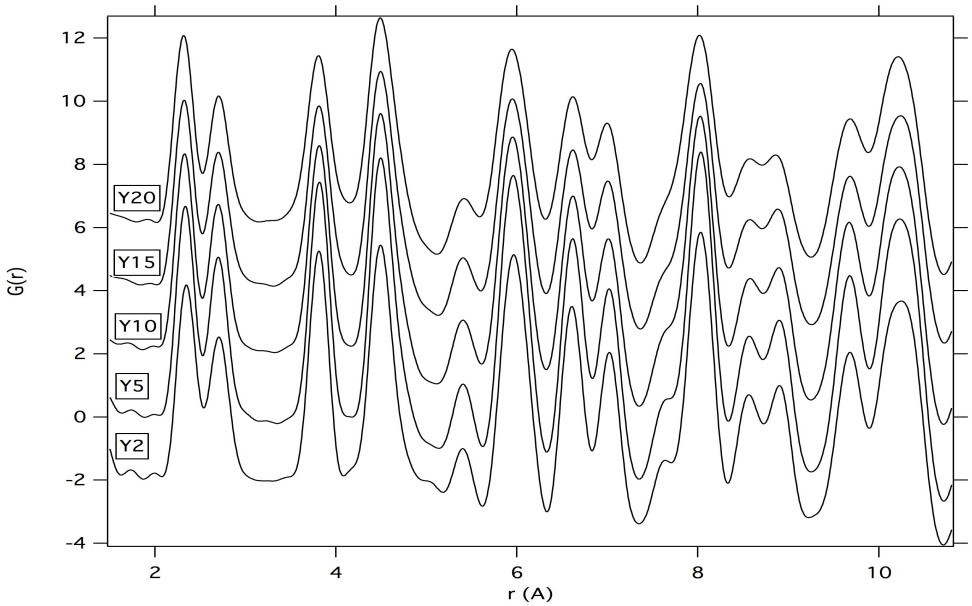
In nanometric ionic materials, when their grain size becomes comparable with the size of the space charge region (SCR), a non-negligible number of atoms is close to region influenced by the grain boundary field; this may modify their transport properties in a significant way. In CeO2 based electrolytes, the specific grain boundary resistivity is much larger than the corresponding bulk value. This proposal aims to study densified Y-doped ceria, with varying dopant content (from 2% to 30% in atoms) and with various grain sizes (obtained by changing the pressure/temperature conditions of High-pressure Field Assisted Rapid Sintering. Total scattering is the ideal technique, because local and average structure in these materials are very likely not coincident, and the very small grain size (below 20 nm) does not allow traditional crystallographic techniques.

Report for the experiment 1-04-74

Dates: From 08/07/2013To 12/07/2013
Title: Local structure of densified nanocrystalline Y-doped ceria

Experimental Scientists: Monica Dapiaggi (main proposer) and Andrea Bernasconi

The experiment was on Y-doped ceria (from 2% to 20% apfu of Y). Half on the experiment was performed on densified samples, and half on their starting powders.
The local contact (Michela Brunelli) was extremely helpful and, together with the beamline scientist (Henry Fischer), they did an excellent job in making us ready to collect data. The experiment was at room temperature, with very small samples (about 300 mg), so it was challenging on itself. However, the data collected were of excellent quality, and immediately usable in PDFgui refinement. This is a comparison of the data on densified samples with different composition.



The following is an example of a structural refinement. The fit is very good, except (as expected) in the first coordination shell, where differences with the average structure can be found.