

3rd Workshop on the Simultaneous Combination of Spectroscopies with X-ray Absorption, Scattering and Diffraction Techniques



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XAS, XRD and Raman study on nanostructured CeO₂-Gd₂O₃ solid solutions

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Ceria (CeO₂) and ceria-based materials have received a lot of attention for many technological applications since they exhibit a number of interesting properties, including high ionic conductivity and excellent catalytic performance for oxidation reactions. The incorporation of metal oxide in the CeO₂ structure significantly improves the oxygen storage capacity, ionic conductivity and surface area of these materials. Doped ceria (CeO₂-Gd₂O₃, -Y₂O₃, -Sm₂O₃) is considered as a promising candidate for electrolytes in intermediate temperature solid oxide fuel cells (IT-SOFCs). Moreover, composite of doped ceria and a metal phase (Ni, Cu, Pt or Pd) have shown excellent performance as anode for IT-SOFCs.

Recent researches have shown that reducing the crystallite size in the nanometric or even submicrometric range significantly improves the ionic transport properties and catalytic performance of these materials. This work aims at revealing size dependent structural feature in CeO₂-Gd₂O₃ (GDC) solid solutions by XRD, XAS and Raman spectroscopy. We have studied GDC powders with a composition of Ce_{0.8}Gd_{0.2}O_{1.9} treated at different temperature in order to yield crystallite sizes ranging from 5 to above 100 nm. The use of complementary techniques provided information on the long range and local order of these materials as a function of crystallite size. The influence of the crystallite size on the defect structure can be a key in understanding the properties of the nanostructured GDC.

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