

Vacancy ordering and oxygen dynamics in oxide ion conducting ceramics: an NMR study

In recent years considerable progress was achieved in the synthesis of high quality ceramics based on doped perovskite-like lanthanum gallate LaGaO_3 . These materials, for instance, Sr and Mg co-doped gallate, $\text{La}_{1-x}\text{Sr}_x\text{Ga}_{1-x}\text{Mg}_x\text{O}_{3-x}$ compounds, exhibit excellent oxygen ion conductivity and are considered as promising electrolytes for solid oxide fuel cells (SOFCs) operating near 800°C .

In the proposed training we will use solid state NMR to study the oxygen environment of the cations of the structure (Ga, La, Mg) in order to understand if the oxygen vacancies exhibit some preference to specific O sites [1].

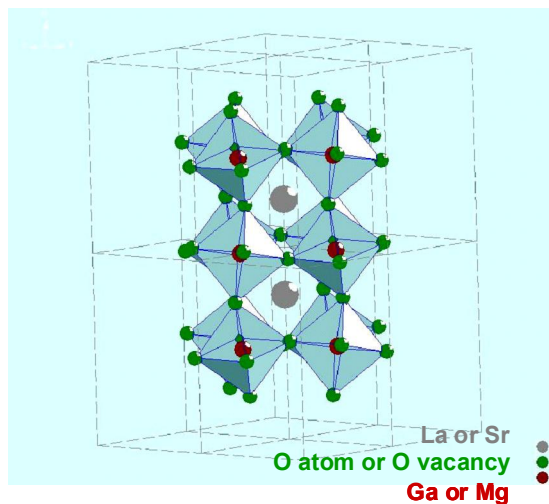
Our aim is to shed light on structural features and their possible relation to fast ion transport.

NMR measurements will be performed in the temperature range [100K-700K] with an NMR spectrometer equipped with a 12Tesla magnet in parallel with X-ray powder diffraction and a.c. conductivity measurements.

The work will be conducted in the frame of collaboration with two Russian laboratories.

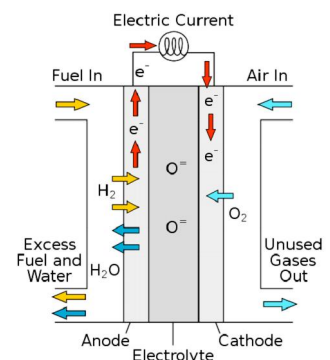
[1] A. Buzlukov, A. Trokiner, S. Verkhovskii, A. Yakubovsky, A. Gerashenko, A. Stepanov, I. Leonidov, O. Leonidova and A. Tankeyev
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Exemple of a co-doped LaGaO_3 compound:



With NMR: local structural properties
→ of oxygen atoms
→ of the cations

Solid Oxide Fuel Cell (SOFC)



The SOFCs use a solid oxide electrolyte to conduct negative oxygen ions from the cathode to the anode.

Arllette TROKINER
Laboratoire de Physique et d'Etude des Matériaux (LPEM)
ESPCI CNRS UMR 8213
10 rue VAUQUELIN, 75231 PARIS CEDEX 0 5
Tel: 33 (0)1 40 79 44 01 Fax: 33 (0)1 40 79 47 44
e-mail : arlette.trokiner@espci.fr