Contribution ID: **25** Type: **Submitted**

Perturbed Angular Correlation γ-γ measurements on Naturally Layered Perovskites Ca_{n+1}Mn_{n}O_{3n+1}

Wednesday, 5 December 2018 14:45 (15 minutes)

Magneto-electric multiferroics form an attractive class of materials, not only for the diversity of exciting fundamental phenomena they present but also by the potential technological applications foreseen. Among them are energy efficient memory devices, multiple state memories, as well highly sensible electrical-magnetic field sensors. Although the research in this area has increased dramatically in the last years, the number of systems presenting magnetoelectric coupling at room temperature is still very scarce.

Naturally layered perovskites (NLP) such as the Ruddlesden-Popper (R.P.) phases ($A_{n+1}B_nO_{3n+1}$) have appeared as a fascinating route to achieve nonexpensive room temperature multiferroic materials. In these NLP, distortions of the lattice such an BO_6 octahedron rotation and tilting modes couple to polar cation dislocation modes inducing a ferroelectric polarization, in a mechanism known as hybrid improper ferroelectricity. The novel idea behind these NLP is that the ferromagnetic and ferroelectric orders can be coupled through the same lattice instability, providing an indirect but very strong magneto-electric coupling.

Perturbed Angular Correlation γ- γ (PAC) hyperfine technique offers a unique opportunity to probe at the local scale the structural, charge and magnetic phase transitions of these NLP systems. At ISOLDE-CERN, by using metastable ^{111m}Cd isotopes as radioactive probes, PAC measurements were performed in a extensive range of temperatures (1150K - 11K), namely on the prototypical hybrid improper ferroelectric and novel multiferroic $Ca_3Mn_2O_7$, as well of its homologous non polar Ca_2MnO_4 and $CaMnO_3$ R.P. compounds. Combined Ab-initio electronic structure calculations in the framework of the Density Functional Theory (DFT) were also performed to understand and show how the measured Electrical Field Gradients at the Cd probing sites are sensitive to the BO_6 octahedron distortion modes present in these compounds.

Primary authors: DA ROCHA RODRIGUES, Pedro Miguel (Universidade do Porto (PT)); Mr LEAL, Tiago (University of Porto); DE PINHO OLIVEIRA, Goncalo (Universidade do Porto (PT)); Mr MOREIRA, Ricardo (University of Porto); CARVALHO TEIXEIRA, Ricardo Cesar (Universidade do Porto (PT)); Mr DE PAULA MIRANDA, Ivan (University of São Paulo); Dr SANTOS, Samuel (University of São Paulo); Prof. CREDIDIO ASSALI, Lucy (University of São Paulo); Prof. PETRILLI, Helena Maria (University of São Paulo); MARTINS CORREIA, Joao (Universidade de Lisboa (PT)); LIMA LOPES, Armandina Maria (Universidade do Porto (PT)); Prof. ESTEVES DE ARAUJO, Joao Pedro (Universidade do Porto (PT))

Presenter: DA ROCHA RODRIGUES, Pedro Miguel (Universidade do Porto (PT))

Session Classification: Solid State Physics