Interface Magnetoelectric Coupling in Co/Pb(Zr,Ti)O_3

O. Vlašín[1], R. Jarrier[1], F. Scheurer[1], P. Ohresser[2], B. Warot-Fonrose[3], C. Marcelot-Garcia[3], R. Arras[3], L. Calmels[3], G. Herranz[4], R. Hertel[1], S. Cherifi-Hertel[1,*]

[1] Institut de Physique et Chimie des Matériaux de Strasbourg, CNRS and Université de Strasbourg, 23 rue du Loess 67300 Strasbourg, France

[2] Synchrotron SOLEIL, L'orme des Merisiers, Saint-Aubin, 91192 Gif-sur-Yvette, France

[3] CEMES-CNRS, 29, rue Jeanne-Marvig, 31055 Toulouse, France

[4] Institut de Ciència de Materials de Barcelona (ICMAB-CSIC), Campus de la UAB, Bellaterra 08193, Catalonia, Spain

[*] Contact : Salia.Cherifi@ipcms.unistra.fr

The cross coupling of magnetic and ferroelectric properties in multiferroic systems has recently been investigated intensively due to its relevance in emerging electronic applications[1]. An outstanding achievement of this research is the electric-field control of magnetic states, offering important advantages in terms of fast and dissipationless operations. Ferromagnetic and ferroelectric composite systems provide a particularly promising pathway towards the efficient electric-field control of the magnetization[2,3], owing to a strong magnetoelectric coupling (MEC).

In this talk, I will present our recent results on room temperature multiferroicity and interface MEC in Co/$PbZr_{0.2}Ti_{0.8}O_3$ (Co/PZT) bilayers. We explore the statics and the dynamics of the interface MEC in the sub-MHz regime by means of electric-field dependent optical measurements. A complex signal is obtained in Co(5-10nm)/PZT bilayers, revealing a multicomponent optical response. We propose a decomposition method to interpret these measurements and to extract the magneto-optical component related to MEC from the overall signal. The coupling mechanism in this system is found to be interface-mediated (*i.e.*, electronically driven), as further demonstrated by complementary methods based on X-ray magnetic circular dichroism measurements and density functional theory calculations. The frequency dependence of the magneto-electric hysteresis loops allows for an analysis of the dynamic properties of the interface coupling.

References

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