COLLÈGE DE FRANCE
1530

CEFIPRA

CHAIRE DE PHYSIQUE DE LA MATIERE CONDENSÉE

M. Antoine GEORGES, Professeur

SEMINAIRE

Lundi 27 juin 2016, 17h00 – 18h30

Salle 5, Collège de France, 11 place Marcelin Berthelot 75005 Paris

Prof. D.D. Sarma

Indian Institute of Sciences, Bangalore, India

Layer-resolved electronic structure of oxide heterostructures using high-energy photoelectron spectroscopy

Cette conférence sera précédée d'un bref exposé

par le **Prof. Mukesh Kumar**

Director of the Indo-French Centre for the Promotion of Advanced Research (IFCPAR/CEFIPRA)

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Résumé du séminaire de D.D.Sarma :

There is a rapidly expanding field over the last few decades that deal with emergent properties at a variety of interfaces formed in heterostructured materials. Specifically, it has been shown that an atomically flat interface between two highly insulating oxide materials can exhibit properties not found in either of the bulk systems defining the interface, such properties covering realms of magnetic-nonmagnetic transitions, insulator-metal transitions, emergence of superconductivity, depending on specific systems and synthesis conditions. There is considerable debate in the literature as to the origin of such diverse properties. Curiously, there is little agreement even on most fundamental aspects such as the nature and the origin of charge carriers in these systems, the issue being complicated by reports of charge carrier densities ranging over 5 orders of magnitude and charge mobilities that can differ by several orders, depending on the synthesis of the sample and the experimental probe employed. In fact, there is a broad agreement that there are most likely to be several different origins of charge carriers in these systems, accounting for such a wide spectrum of properties.

It is in general difficult to probe directly the nature of such interface states due to the fact that these are typically buried under a depth and represent a very small volume fraction of the entire sample. We have shown in recent times that x-ray photoelectron spectroscopy with a widely tunable photon energy can be used very effectively to obtain spatially resolved electronic structure information, thereby making it the ideal probe to investigate interface properties in diverse heterostructured systems. We apply this technique to address some of these vexing, unresolved issues in the physics of oxide heterostructures with two different systems, namely the originally discovered $LaAlO_3$-$SrTiO_3$ as well as $LaTiO_3$-$SrTiO_3$ interfaces.