

## Séminaire SOLEIL

**Photoemission with soft and hard x-rays :  
some future perspectives****Charles S. FADLEY**

*Department of Physics, University of California  
Materials Sciences Division, Lawrence Berkeley National Laboratory  
APTCOM Project, Triangle de Physique*

Invité par Jean-Pascal RUEFF

**Lundi 15 septembre - 14h00****Petit Amphi – Bâtiment Accueil SOLEIL**

In these three seminars at Soleil, I will consider several recent developments in the use of soft-x-ray (~0.5-2 keV) photoemission (XPS, SXPS) and hard-x-ray (~2-10 keV) photoemission (HXPS, HAXPES, HIKE) for the study of a variety of systems, from spintronic materials to semiconductors to photovoltaic systems to solid/liquid interfaces, using recent results from our collaborations and other groups as illustrations. These new directions involve combining SXPS and HXPS, as well as x-ray optical effects including standing waves, total reflection, and resonant excitation to provide much enhanced depth resolution for both the bulk properties of complex materials and the buried layers and nanostructures in multilayer nanostructures. Adding the dimension of higher ambient pressures in the multi-Torr regime also should permit studying the depth dependence of concentration and potential in solid/gas and solid/liquid interfaces, and be of interest to chemical physicists/physical chemists.

**21 July** : In the first seminar, I will introduce the basic goals and the physics behind these new aspects of photoemission, including advantages and disadvantages.

**15 September** : In the second, I will consider applications of hard x-ray photoemission to the properties of complex bulk materials, including the possibility of hard x-ray photoelectron diffraction (HXPD) and angle-resolved photoemission (HARPES), the measurement of band-offsets in oxide and semiconductor multilayers, and the detection of delta-layer dopants and quantum-size effects on electronic structure in complex oxides. The use of hard x-ray standing waves and total reflection effects to look at buried interfaces will also be considered.

**15 and 22 September** : In the second and third, I will consider both soft- and hard- x-ray photoemission, including the emerging interest in soft x-ray and hard x-ray ARPES, to study buried layers and interfaces in transition-metal oxide and magnetic multilayers. Special emphasis will be on the use of standing waves and resonant excitation from multilayer samples to enhance depth contrast in spectroscopy, as well as in standing-wave angle-resolved photoemission (SWARPES) and photoelectron microscopy. Such combined SXPS and HXPS studies, including standing-wave excitation, have for example, permitted directly observing changes in the bonding and the k-resolved electronic structure near a buried SrTiO<sub>3</sub>/La<sub>0.7</sub>Sr<sub>0.3</sub>MnO<sub>3</sub> interface, the depth profile of magnetization at the Fe/MgO interface, and a two-dimensional electron gas at the SrTiO<sub>3</sub>/GdTiO<sub>3</sub> interface. A first observation of plasmon dispersion in ARPES will also be discussed. Finally, I will consider standing-wave ambient pressure photoemission (SWAPPS) as a powerful new method for studying the solid/liquid and solid/gas interface.

**References**

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**Ce séminaire sera suivi d'une pause-café**

*Formalités d'entrée : accès libre dans l'amphi du Pavillon d'Accueil. Si la manifestation a lieu dans le Grand Amphi SOLEIL du Bâtiment Central, merci de vous munir d'une pièce d'identité (à échanger à l'accueil contre un badge d'accès).*

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