Réunions scientifiques

Séminaires

Séminaire SOLEIL

Characterizing surface states of noble metals using angle resolved photoemission (ARPES): from cross-section modulations to scattering phenomena

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Invité par Antonio TEJEDA

Lundi 8 avril à 14h00
Grand Amphi SOLEIL

Every solid-state material has electrons at its surface with spatial and energetic distributions that depend both on the atomic elements that conform it and its crystalline structure. These surface electrons can give rise to surface states that have been experimentally investigated ever since both vacuum conditions and surface sensitive techniques were accessible. A lot of effort has been devoted into understanding the nature of surface states of noble metals not only on ideal (flat and clean) surfaces but also when they are nanostructured. These surface states wavefunctions are defined as two-dimensional Bloch waves decoupled from the bulk that feature exponentially decaying oscillations toward the interior of the crystal.

In this seminar I will review the photoemission cross-section of Shockley states of Cu(111), Ag(111) and Au(111) which show rich structures and marked differences to one another that do not follow the generally accepted nearly free electron (NFE) model for the final state [1,2]. Angle resolved photoemission data are interpreted within a one-step *ab initio* theory, revealing a multiple Bloch wave structure of photoemission final states. The role of the surface reconstruction is key to understand the cross-section lineshape in the case of Au(111) [2].

On a second part of the talk I will discuss the lateral scattering of surface electrons on a curved crystal of Ag(111) [3]. The beauty of these surfaces is that they present a smooth variation of the vicinal angle from the flat case to terraces of the order of 10nm, i.e., a tunable step lattice constant, and allow for a straightforward and rational investigation of all physical-chemical phenomena related to the presence of atomic steps. Our STM and ARPES data show that the Shockley state scatters at both step an dislocation arrays. The formation of laterally confined quantum well states in vicinal surfaces as opposed to propagating superlattice states depends on the loss of coherence driven by imperfection in the superlattice order.

[1] J. Lobo-Checa, J. E. Ortega, A. Mascaraque, E. G. Michel, and E. E. Krasovskii, *Phys. Rev. B* **84**, 245419 (2011).
[2] P. Borghetti, J. Lobo-Checa, E. Goiri, A. Mugarza, F. Schiller, J E. Ortega and E. E Krasovskii, *J. Phys.: Condens. Matter* **24,** 395006 (2012).
[3] J. E. Ortega, J. Lobo-Checa, G. Peschel, S. Schirone, Z. M. Abd-el-Fattah, M. Matena, F. Schiller, P. Borghetti, P. Gambardella, and A. Mugarza. (in preparation).

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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