DIRECTION DES SCIENCES DE LA MATIERE,
INSTITUT RAYONNEMENT MATIÈRE DE SACLAY

SERVICE DE PHYSIQUE ET DE CHIMIE DES SURFACES ET DES INTERFACES

SEMINAIRE *

Vendredi 26 juin 2009 à 11h00

Bâtiment 466, salle 111 - CEA Saclay, 91191, Gif sur Yvette

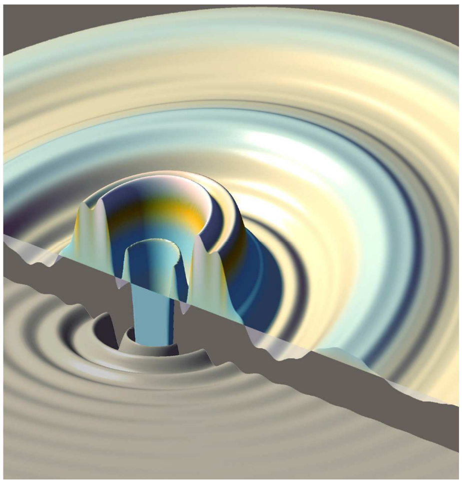
Acoustic Surface Plasmons at Metal Surfaces

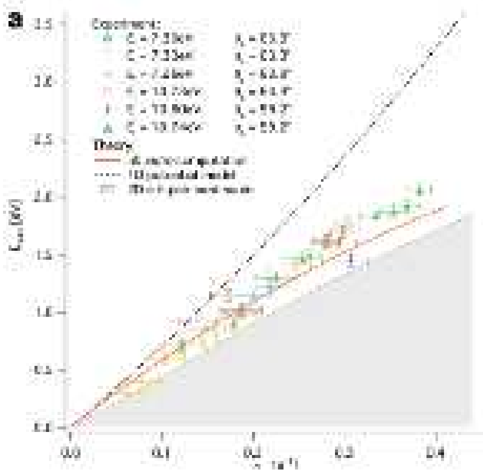
Prof. Mario Agostino Rocca

Dipartimento di Fisica Università di Genova, Italy

Invité par Patrick Soukiassian

Nearly two-dimensional (2D) metallic systems formed in charge inversion layers and artificial layered materials permit the existence of low-energy collective excitations called 2D plasmons, or acoustic surface plasmons (ASP). They have raised considerable interest because of their acoustic dispersion allowing to play a role in the many dynamical processes involving electrons and phonons, including the formation of Cooper pairs in high-transition-temperature superconductors. The square root like dispersion limits, however, the matching conditions to the very long wavelength limit. Another possible application is in plasmonics, a new branch of optoelectronic in which light signals are processed after being converted into plasmons, taking advantage of the reduced wavelength to further miniaturize the devices. Metals are known to support electronic states that are confined to the surface, forming a nearly 2D electron-density layer. It was argued that these systems cannot support an ASP because the latter would be screened out by the underlying bulk electron density until recently when new theory demonstrated the non-local character of the dielectric function prevents the screening by the 3D electronic states. Even more interestingly, its dispersion is linear instead of square-root like, increasing the phase space over which matching with phonons is possible and opening up the possibility of converting light signals into plasmons without distortion for applications in plasmonics. Finally the electron density fluctuation associated to the ASP is much larger than the one of Friedel oscillations and is expected to play a role in chemistry. We demonstrated the existence of this mode by angle-resolved electron energy loss spectroscopy (HREELS) for the bare Be(0001) surface [see figure] and, more recently, also for Cu(111) and for reconstructed Au(111) and Au(778) surfaces. As always in physics, our experiments open up new questions.





*** SERA PRECEDE D'UNE PAUSE-CAFE A PARTIR DE 10H30**

<u>Formalités d'entrée</u> : Contacter le secrétariat pour l'établissement de votre autorisation d'entrée sur le centre de Saclay. Tel : 01.69.08.65.32 ou 01.69.08.40.12; Fax : 01.69.08.40.44 ; e-mail : catherine.julien@cea.fr. Le délai minimum est de 24 heures pour les visiteurs ressortissants des pays de l'Union Européenne, et de huit jours pour les autres. Sans autorisation, vous ne pourrez entrer sur le centre de Saclay. Dans tous les cas, se munir d'une pièce d'identité.