Soutenance de thèse

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" Interaction d'atomes hydrogène rapides (keV) avec des surfaces : Diffraction et Formation d'ions négatifs "

We have investigated the properties of charge exchange in grazing incidence scattering of keV hydrogen atoms and ions on LiF(001) and HOPG (Highly oriented Pyrolytic Graphite). The experimental approach is based on the coincidence detection of the scattered particles and the secondary electrons emitted during the interaction; in addition, when using a pulsed beam, the projectile energy loss is given by the time-of-flight.

On LiF(001), using H° with normal energy lower than 1 eV, the interaction is gentle enough to allow the diffraction of H°. Surprisingly, diffraction is also observed with incident H^+. A simple model is proposed to explain the limited decoherence induced by the inelastic electron capture.

On HOPG, scattering has been investigated at much higher normal energies, between 1 and 5 eV. In this regime, a large fraction of negative ions in the scattered beam could be observed. Independently of the incoming charge state (H^+ or H°), up to 10% H^- fraction is measured, in agreement with prior studies. This relatively high fraction, much larger than reported on metals and comparable if not larger than typically observed on ionic insulators, has remained unexplained up to now. Using our coincidence data, we were able to unravel the processes at work in graphite.

The experimental energy loss data suggest two distinct mechanisms, one metal-like and the other insulator-like, with the latter pointing to an electronic band located 6 eV below Fermi level. Using reported photoemission data, we could identify in the projected electronic band structure the property that is responsible for the efficient production of negative ions.

ATTENTION JOUR ET HEURE INHABITUELLES

Vendredi 14 septembre 2012 à 14h00

Bât. 351 – Bibliothèque (2ème étage)

Université Paris-Sud 91405 Orsay Cedex

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