Recent Advances in 2D-Band Structure Imaging by *k*-PEEM and Perspectives for Technological Materials

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ABSTRACT

The imaging of surfaces using the PhotoElectron Emission Microscopy (PEEM) technique has recently received considerable interest, mainly thanks to the use of high brilliance synchrotron radiation which facilitates the study of surface properties and chemical selectivity [1, 2]. By placing a transfer lens in the optical column of a high transmission and full energy-filtering PEEM, it is possible to image the focal plane, instead of the image plane. Hence, the corresponding image shows the angular distribution of the emitted photoelectrons, for a given kinetic energy. By varying the kinetic energy, the complete energy filtering provides full 2D cuts of the band structure in reciprocal space, called k-PEEM [3]. This approach has two advantages over classical ARPES measurements. No uncertainty is introduced due to sample rotation and the images obtained are directly $I(k_x, k_y)$. Therefore, full 2D band mapping is possible, with potential acquisition times considerably shorter than in a classical ARPES set-up.

The k-PEEM technique has been successfully used to study the band structure of metals and alloys, such as Ag(111) and Ag(001) [3], Cu(111) [4], and Au(111), as shown in figure 1 (left). The 2D mapping of these samples enabled us to achieve high momentum resolution and to clearly observe surface features, demonstrating the performances of this technique [5]. We have already performed some studies on epitaxial graphene on SiC, which had reveal the potential of this technique, by presenting numerous information on a selected area, providing chemical and work function mapping along with its band structure. By these very promising results on the performance of this technique, we report here the recent advances of band structure imaging on technological samples of high interest.

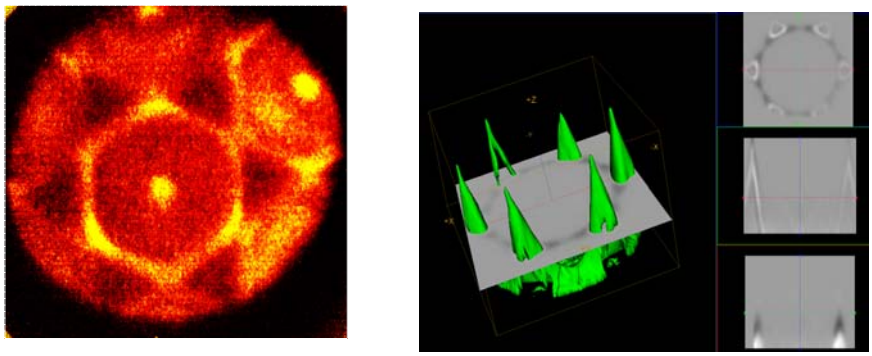

FIGURE 1: (left) *k*-space image of Au(111) taken at the Fermi energy, excited at 90 eV, with an exposure time of 100 seconds. (right) Experimental 3D image [$I(k_x, k_y, E)$] obtained on epitaxial graphene on SiC(0001), excited with He I

Keywords: X-PEEM, *k*-PEEM, band structure imaging.

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