

## Crystallographic and electronic structure of graphene on the pseudomorphic Cu/Ir(111) substrate

H. Vita<sup>1</sup> S. Boettcher<sup>1</sup> K. Horn<sup>1</sup> E. N. Voloshina<sup>2</sup> R. E. Ovcharenko<sup>2</sup>  
T. Kampen<sup>3</sup> A. Thissen<sup>3</sup> Y. S. Dedkov<sup>3</sup>

<sup>1</sup>Fritz-Haber-Institut der Max-Planck-Gesellschaft, 14195 Berlin, Germany

<sup>2</sup>Institut f. Chemie, Humboldt Universitaet zu Berlin, Brook-Taylor-Str. 2, 12489 Berlin, Germany

<sup>3</sup>SPECS Surface Nano Analysis GmbH, Voltastrasse 5, 13355 Berlin, Germany

Understanding the nature of the interaction at the graphene/metal interfaces plays a critical role for the correct description of the graphene-based electron- and spin-transport devices. Here, several factors, such as doping level or/and hybridization of the electronic states of graphene and metal around the Fermi level defines the properties of such interfaces. Starting from *p*-doped nearly free-standing graphene on Ir(111), we tailor its properties via intercalation of one monolayer of Cu. The crystallographic and electronic structures of the resulting *n*-doped nearly free-standing graphene layer on the lattice mismatched pseudomorphic Cu/Ir(111) substrate were studied by means of scanning probe microscopy (STM and 3D NC-AFM) and angle-resolved photoelectron spectroscopy in combination with state-of-the-art density functional theory calculations. These results allow to understand the general mechanisms that are responsible for the modification of the electronic structure of graphene at the Dirac point (doping and the band-gap opening). These findings for the graphene/metal system will help in the engineering of the future graphene-based devices.