Intercalation of Cu underneath a graphene layer on Ni(111) and Co(0001) substrates studied with a synchrotron radiation

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The electronic structure of graphene on a metallic substrate is similar to that of free-standing graphene, but there are essential differences, which depend on a structure and a material of the substrate and are determined by the character of the graphene-substrate interaction. One of the main tasks is to study the properties of graphene on a wide range of substrates, as the solution of this problem provides an opportunity to purposefully affect on the characteristics of this material. An efficient approach to the solution of this task is based on a phenomenon of intercalation of various atoms underneath graphene films on metals.

Thick monocrystalline films of Co(0001) and Ni(111) were deposited on a preliminarily cleaned surface of tungsten crystal W(110) under the ultra-high vacuum conditions. Graphene films of a good quality were prepared on Co(0001) and Ni(111) films in a process of propylene cracking [1,2]. Intercalation of copper atoms underneath a graphene layer took place after the thermal annealing of pre-deposited copper layers [3].

The electronic structure of a core C1s level and a valence band of a graphene layer on the metallic substrates before and after the copper intercalation has been studied with X-ray photoelectron spectroscopy and angle-resolved ultra-violet photoelectron spectroscopy. X-ray absorption fine structure near the carbon K-edge has been measured for studying unoccupied graphene states. Synchrotron radiation with a linear polarization has been used to reveal a contribution of π^* and σ^* states [4].

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