Lattice constant reduction of the graphene/Ni(111) due to Au intercalation

Chikina A.G.*,Fedorov A.V., Usachev D.U, Adamchuk V.K.[1]

[1]*SPbGU, 199034, St.Petersburg, Russia*
**e-mail: chikina_alla@bk.ru*

Graphene, a two-dimensional crystal of graphite, has attracted special interest as one of the most stable nano-objects, with good conductivity in the class of monatomic films. Its unique properties are connected with specific features of the electronic structure. Graphene on Ni(111) system has received a great attention in the last few years. It has already been demonstrated that graphene epitaxial grown on Ni(111) has electronic structure quite different to pristine graphene due to high overlap of the Ni 3d and C 2p states. Strong interaction with substrate surface and lattice mismatch leads to the interlayer inelastic stress in the graphene overlayer. Intercalation of the noble metals leads to reducing of the graphene Ni interaction. This work is aimed to get further insight into effect of graphene substrate interaction on overlayer morphology.

The thin film Ni(111) was prepared using high-vacuum evaporation method on the surface of single crystal W (110). Graphene was prepared using chemical vapor deposition technique (CVD) [1, 2]. The system under investigation was characterized using X-Ray photoelectron spectroscopy (XPS), Auger electron spectroscopy (AES) and low energy electron diffraction (LEED). To get quantitative insight into the change in the graphene lattice constant upon Au intercalation LEED patterns were proceeded according to the technique described into [3].

It was found that the disposition of graphene on nickel, it feels a slight elastic tension, resulting in an decrease on 0.3%. in the interatomic distance as compared with the value before Au intercalation During deposition and following intercalation of gold there is decreases the interaction with the substrate, resulting in a decrease in the lattice constant of graphene. As a result, its value approaches the value of the lattice constant of graphite.

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