WRINKLES IN GRAPHENE

ŘÁHOVÁ Jaroslava, DEL CORRO Elena, KAVAN Ladislav, KALBÁČ Martin, FRANK Otakar

J. Heyrovsky Institute of Physical Chemistry of the AS CR, v.v.i., Prague, Czech Republic, EU

Abstract

Graphene´s unique properties predestines it to be great material for the future use in nanoelectronics. Mechanical deformation is one of the methods to manipulate optoelectronic properties in graphene. However, not many succesfull experiments have been performed up to date. One particular way to induce changes in the crystal structure is through bending instability, which creates wrinkles in the system. Wrinkles can be the right way to reach the 1D quantum confinement. In our work we report on the formation as well as on the characterisation of wrinkles created on prestrained polymeric substrates.

Graphene flakes were preparad by mechanical exfoliation on prestrained substrates (bent PMMA-SU8 beam or stretched PDMS). Monolayer as well as few layer graphene sections were identified with optical microscopy. The number of graphene layers was determined by Raman spectroscopy. The surface wrinkling was characterised by Atomic Force Microscopy and by Raman mapping.

Wrinkles formed in graphene placed on prebent (~1%) PMMA-SU8 coated beams exhibit strong linear relation between wavelenght and amplitude as well as the dependence of these parametres on the number of graphene layers. The wrinkles have a clean sinusoidal shape and the onset of wrinkling from the edges corresponds to the wrinklon model(1).

Wrinkles formed on highly prestrained (~50 %) PDMS show inhomogeneous distribution as well as sharp ridges and higher aspect ratio. The ridges are not in contact with substrate surface.

Keywords: Wrinkles, graphene, mechanical stress, Raman spectroscopy

ACKNOWLEDGEMENTS:

This work is supported by Czech Science Foundation (project nr. 14-15357S).

REFERENCES:

[1] Vandeparre et al. PRL 106, 2011, 224301

Author did not supply full text of the paper.