Influence of hydrogen intercalation on graphene/Ge(001)/Si(001) interface

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Hydrogen intercalation is widely used to weaken graphene-substrate interactions and as a result enhancing graphene's electronic properties. However, as of today there are no experimental results showing the influence of hydrogen intercalation on the substrate's surface morphology and consequently on transport properties of graphene/Ge(001)/Si(001) system.
This work presents the study of microstructure of hydrogen intercalated graphene grown on Ge(001)/Si(001) substrate. Several characterization techniques were applied: secondary ion mass spectrometry and Raman spectroscopy in order to confirm presence of hydrogen located on the germanium surface, high resolution scanning electron microscopy to show the surface morphology and Hall measurements to provide information about graphene's electronic properties.
The findings reveal a significant change in the surface morphology of germanium substrate: faceting structure disappears almost completely, the germanium surface flattens, and steps/terraces are formed (Fig 1). This leads to degradation of graphene's electronic properties, which shows the negative impact of hydrogen intercalation when graphene is grown on the germanium substrate [1].

Acknowledgments
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References

[1] J. Grzonka, I. Pasternak, P.P. Michałowski, V. Kolkovsky, W. Strupinski, Influence of hydrogen intercalation on graphene/Ge(001)/Si(001) interface Appl. Surf. Sci. 447, 582-586 (2018)

Figures

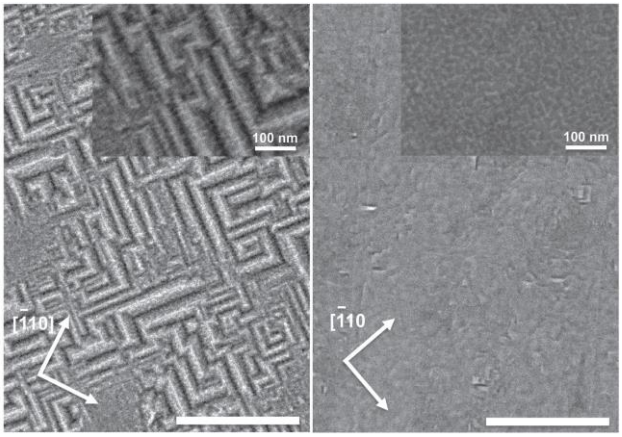

Figure 1: SEM images showing the topography contrast of (a) GR/Ge and (b) GR/H/Ge samples. A significant change in surface morphology of the germanium substrate is observed after hydrogen intercalation. Nanofacet structure undergoes substantial flattening. Insets present nanometer size wrinkles of graphene, which are more pronounced for GR/H/Ge sample