Viktoria Ritter: Silicene passivation by few-layer graphene

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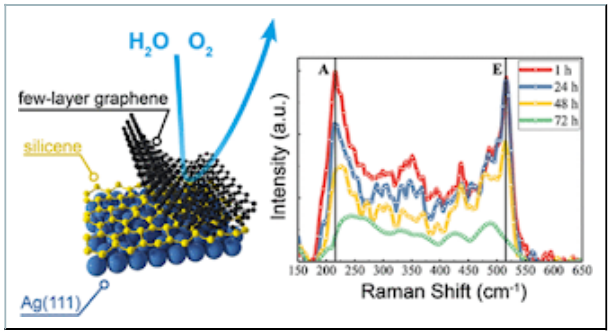

Silicene is of foremost interest as it combines an ultra-high carrier mobility with the unique opportunity to tune the bandgap. Due to its intrinsic instability, the synthesis of silicene requires ultra-high vacuum (UHV) conditions and it oxidizes within minutes when exposed to ambient conditions.
Here, we demonstrate the encapsulation of 4x4 silicene grown on Ag(111) by few-layers graphene (FLG) flakes, allowing its stabilization for up to 48h. Natural graphite is exfoliated mechanically on top of a vacuum-compatible polyimide adhesive tape and inserted into a specially designed UHV chamber. After Si evaporation, the formation of silicene is verified via LEED analysis. Consecutively, FLG flakes are mechanically transferred atop of the silicene layer. A Raman analysis of the encapsulated silicene is performed under ambient conditions. The acquired data are reported in Figure 1. It shows the well-known peaks for exfoliated FLG, labelled, respectively, as D, G, G* and 2D, alongside two additional peaks located at 216 cm-1 and 515 cm-1, labelled as A and E. The intensity of the A mode, which is related to the out-of-plane vibration of optical phonons (ZO), was interpolated to obtain a heatmap showing the presence of silicene, as shown in Figure 2. Notably, silicene can be detected under the whole capping layer, with the exclusion of those areas that are close to the FLG edges. This is probably caused by a non-ideal adhesion of the FLG to the silver substrate. Polarization-dependent measurements, shown in Figure 3, demonstrate that the symmetry properties of silicene are unaltered by the capping process, as a result of a weak interaction with the encapsulation layer.

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Viktoria Ritter, M.Sc. B.Sc. received her Master's degree in Geomaterials and Geochemistry from the Technical University Munich as well as from the Ludwigs-Maximilians University. After completing her thesis about Covalent Organic Frameworks analysis via Scanning Tunelling Microscopy she joined the silicene research group at the Vienna University of Technology. Currently she is pursuing her PhD in electrical engineering at the Institute for Solid State Electronics focusing on the passivation of silicene by further 2D-materials.

Kommentare

Sie sind nicht berechtigt, Kommentare hinzuzufügen.