Epitaxial Graphene Induced Surface Reconstruction in Ge(110) Revealed by High-Resolution X-ray Diffraction and Scanning Tunneling Microscopy

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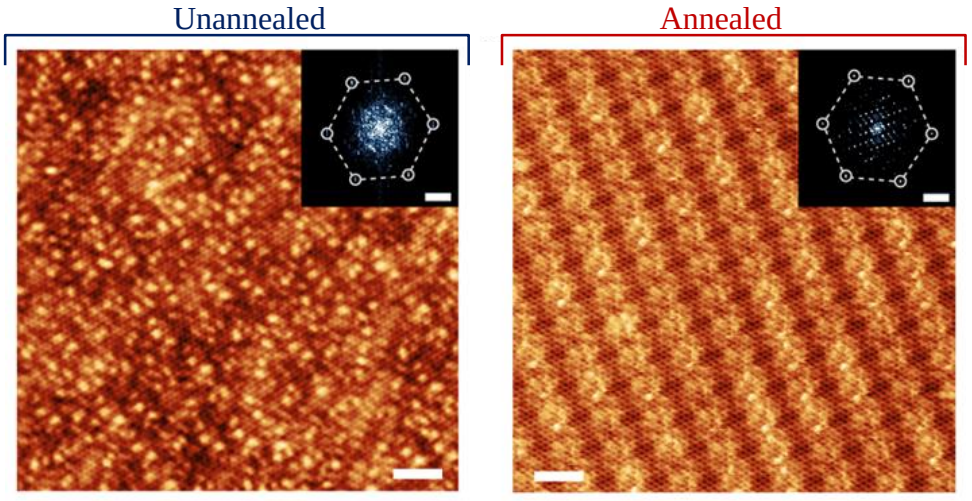
Understanding and engineering the properties of single-crystal surfaces has been critical in developing functional microelectronics at the nanoscale. Previously achieved through covalently bonded adatoms at surfaces, here we report how weakly bonded van der Waals' solids influence the development of new surface reconstructions in the EG/Ge(110) system. Employing scanning tunneling microscopy (STM), in-plane X-ray diffraction (XRD), and crystal truncation rod scattering (CTR) we investigate EG/Ge(110) and present a Ge(110) reconstruction stabilized by the presence of epitaxial graphene unseen in bulk semiconductor surfaces [1]. The combined STM and XRD results show the EG/Ge(110) interface, upon annealing, rearranges into a (6x2) superstructure persistence over large areas of the EG/Ge(110). CTR studies confirm the vdW gap and reveal that graphene sits atop the surface reconstruction with a 0.34 nm spacing. This structure represents a new avenue towards nanoscale engineering, using a vdW atomic layer to induce new stable surface reconstructions.



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[1] B. Kiraly, Nano Lett. **15**, 7414(2015).