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Rb-functionalized epitaxial graphene on SiC(0001)

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Since its discovery, graphene has received much attention due to its outstanding properties. However, the technological application of the pristine material has faced some challenges. Incorporation of metal atoms in the pristine graphene can overcome some of these limitations by varying its electronic, electrical, thermal, and magnetic properties, making the metal-functionalized graphene system more suitable for applications. The attention around Rubidium functionalization of carbon nanostructures already started in the 1930s. The potential applications of Rb-graphene in hydrogen-storage and superconductivity has driven the research towards a further understanding of the system. Among the many questions that arise on this system, the most compelling is whether Rb can and does intercalate monolayer graphene, as Li, or bilayer graphene, as in graphite intercalation compounds. Besides, we need to understand what is the energy required for the process, i.e. whether intercalation can be obtained at room temperature or only at low-temperatures, and how the adsorption changes the surface and the electronic properties of the graphene substrate. We will present an answer to some of these open questions. In our work we studied the interaction of epitaxial monolayer graphene on SiC(0001) with Rb deposited at room temperature. We performed diffraction analysis by means of low-energy-electron-diffraction (LEED) and obtained atomically resolved images by scanning-tunneling-microscopy (STM). We will report successful intercalation at room temperature of Rb on epitaxial monolayer graphene and different Rb ordered structures that can form. The combined results from LEED and STM lead to a better understanding of the adsorption dynamics, interaction between graphene and Rb atoms, the surface structure, as well as the Rb intercalation mechanism.

Figures

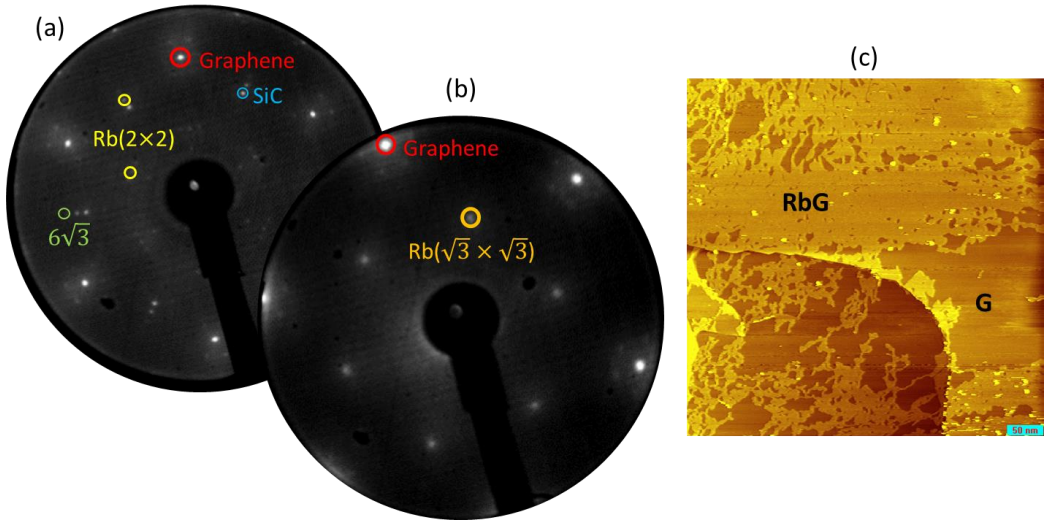

Figure 1: LEED patterns of different Rb-graphene structures [(a) 2×2 and (b) √3×√3] and (c) large area [500 nm × 500 nm] STM scan of the Rb-graphene surface. G: clean monolayer graphene, RbG: Rb-intercalated graphene.