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Direct Imaging of Intrinsic Molecular Orbitals Using Graphene-based Moiré Pattern[1] HAITAO ZHOU, GENG LI, JINHAI MAO, YELIANG WANG, SHIXUAN DU, HONGJUN GAO, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China, INSTITUTE OF PHYSICS, CHINESE ACADEMY OF SCIENCES, BEIJING 100190, CHINA TEAM — Direct imaging of the intrinsic electronic structure at high resolution is of both fundamental and technological importance for investigating molecular interaction and mechanisms. Metallic or semiconducting materials are commonly used as substrates for molecular adsorption. Generally, the strong interactions between molecules and these substrates significantly change the intrinsic electronic and geometric structures of the adsorbed molecules. In order to overcome this problem, much effort has been made by passivating substrates with various buffer layers, for instance, thin organic films, NaCl, and oxides. We demonstrate the graphene grown epitaxially on Ru(0001) can be used as a buffer layer to study the intrinsic electronic properties of adsorbed molecules. The intrinsic molecular orbitals of C60, pentacene and perylene-3,4,9,10-tetracarboxylic dianhydride molecules were imaged by scanning tunneling microscope (STM). High resolution STM images of the molecules reveal that the graphene layer decouples the individual molecules electronically from the metallic substrate, which is also verified by density functional theory calculations.

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