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Templating sharp molecular-like states using domain boundaries of the 2D material silicene on ZrB_2 CYRUS F. HIRJIBEHEDIN, BEN WARNER, TOBIAS G. GILL, University College London (UCL), UK, VASILE CACIUC, NICOLAE ATODIRESEI, Forschungszentrum Juelich and JARA, Germany, ANTOINE FLEURENCE, Japan Advanced Institute of Science and Technology (JAIST), Japan, YASUO YOSHIDA, YUKIO HASEGAWA, University of Tokyo, Japan, STEFAN BLUEGEL, Forschungszentrum Juelich and JARA, Germany, YUKIKO YAMADA-TAKAMURA, Japan Advanced Institute of Science and Technology (JAIST), Japan — To achieve the goal of scalable molecular electronics, it will be necessary to retain the functionality of molecular components even when the molecules are strongly bound to a surface. The structural and electronic properties of two-dimensional (2D) materials have already proven useful in templating molecules at the nanoscale. However, hybridization between substrate and molecule can often destroy the single molecule functionality essential for use in electronic devices. Here we use scanning tunneling microscopy (STM) and spectroscopy coupled with density functional theory (DFT) studies to show how the domain boundary structure of the 2D material silicene on ZrB_2 can be used to linearly template iron phthalocyanine (FePc) molecules, even at room temperature, while retaining sharp, molecular-like electronic states that are indicative of the isolated molecule. These results highlight the important role of the interface between molecules and 2D materials as well as their edges in controlling the properties of the combined system, and in determining its usefulness in future device applications.

Cyrus Hirjibehedin
London Center Nanotechnology, UCL

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