chem2Dmat
September 03-06, 2019 • Dresden, Germany
European Conference on Chemistry of Two-Dimensional Materials

Mimic 1D properties on continuous 2D materials: the pilot case of graphene on NiC_x/Ni(100)

A. Sala[12], V. Carnevali[1], Z. Zou[2], M. Panighel[2], F. Genuzio[3], T. O. Menteş[3], A. Locatelli[3], C. Cepek[2], M. Peressi[1], C. Africh[2], G. Comelli[12]

(1) Department of Physics, University of Trieste, via Valerio 2, 34127 Trieste, Italy
(2) IOM-CNR, S.S. 14 km 163.5 in AREA Science Park, 34149 Trieste, Italy
(3) Elettra Sincrotrone Trieste, S.S. 14 km 163.5 in AREA Science Park, 34149 Trieste, Italy
sala@iom.cnr.it

Tailoring electronic properties on 2D materials by inducing 1D electronic states via lateral confinement is a well-established research route, with real applications almost exclusively on graphene due to the difficulty of bottom-up synthesis of nanoribbon made of other 2D materials. Here we present a different approach, based on smart choice of the substrate, that allows the creation of 1D stripes embedded on a continuous 2D material, namely graphene grown on Ni(100)[1]. Such stripes are forced to have different electronic properties by the selective formation at the graphene/metal interface of nickel carbide that decouples graphene from the substrate only at selected lanes of 1D moiré. Our results, obtained with combination of microscopy, spectroscopy and diffraction techniques and corroborated by DFT calculations, show that such 1D stripes have electronic properties that resemble the ones of zig-zag graphene nanoribbons, and that this procedure offers the unprecedented possibility to measure the band structure of 2D materials with 1D states by angle-resolved photoelectron spectroscopy. This approach can in principle be extended to other 2D materials, giving access to characterization of low-dimensional states without passing through bottom-up synthesis of nanoribbons.

References

[1] Z. Zou *et al*., Carbon **130** (2018) 441-447