A two-dimensional crystalline form of silicon oxide

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PHD GRANT

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Graphene was the first member of the family of two-dimensional (2D) materials. The quest for novel 2D materials is boosted by the prospect for complementing the toolkit of properties of this family. A much sought-for property for optoelectronics applications is a wide band-gap in the electronic band-structure. To this respect, silicon-based 2D materials, noteworthy silicon oxide and silicon carbide, are exciting candidates.

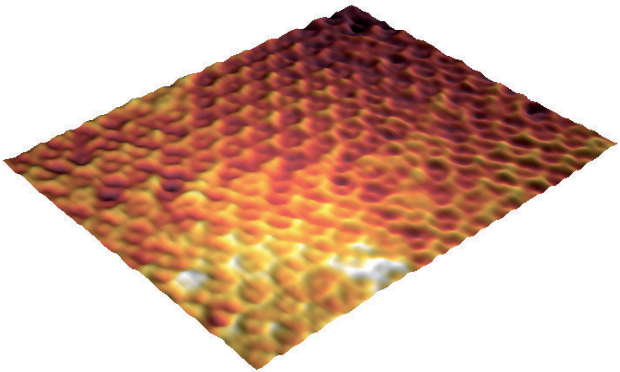

Fig.1: Scanning tunneling micrograph of the honeycomb lattice of silicon oxide, with defects. The distance between the centers of hexagons is 0.54 nm.

Our aim was to prepare these materials and to understand their structure, including the nature of defects which are expected to have strong influence on the microscopic and macroscopic properties. A single-layer of crystalline silicon oxide, prepared on a metallic surface, was specifically addressed (Fig. 1). We revealed that epitaxy in this system systematically involves one-dimensional defects. We also identified a local modulation of the chemistry of silicon atoms in the system.

This study is currently pursued, and focuses on the structural phases transitions in this system, which is especially rich.

OUTCOMES

[1] Degenerate epitaxy-driven defects in monolayer silicon oxide, Phys. Rev. B 92, 161410(R) (2015).

[2] Strain relaxation in CVD graphene: wrinkling with shear lag, Nano Lett. 15, 5098 (2015).

Oral presentations: ECOSS31, Barcelona, Spain, 2015. EWEG/2D, Bergish Gladbach, Germany, 2016.

Leverage: ANR project 2DTransformers, 2015.