

## Structure and electronic properties of h-BN on curved crystals

F. Schiller<sup>1,2</sup>, K. Ali<sup>1</sup>, A.A. Makarova<sup>3</sup>, C. Laubschat<sup>3</sup>, D.Y. Usachov<sup>4</sup>, D.V. Vyalikh<sup>2,5</sup>, J.E. Ortega<sup>1,2,6</sup>, L. Fernández<sup>1,6</sup>

<sup>1</sup>CFM-MPC, Paseo de Manuel Lardizabal 5, San Sebastián, Spain

<sup>2</sup>Donostia International Physics Center, Paseo de Manuel Lardizabal 4, San Sebastián, Spain

<sup>3</sup>Technische Universität Dresden, Institut für Festkörperphysik, Dresden, Germany

<sup>4</sup>St. Petersburg State University, 7/9 Universitetskaya Nab., St. Petersburg, Russia

<sup>5</sup>Ikerbasque Foundation, Bilbao, Spain

<sup>6</sup>Universidad del País Vasco UPV-EHU, San Sebastián, Spain

frederikmichael.schiller@ehu.es

The structural and electronic properties of hexagonal boron nitride (h-BN) grown on stepped Ni and Rh surfaces are systematically investigated using cylindrical Ni and Rh crystals as a tunable substrate. Our experiments reveal homogeneous h-BN monolayer coating of the entire curved surface, which in undergoes an overall faceting on Ni with large facets but h-BN nanoribbon growth on Rh.

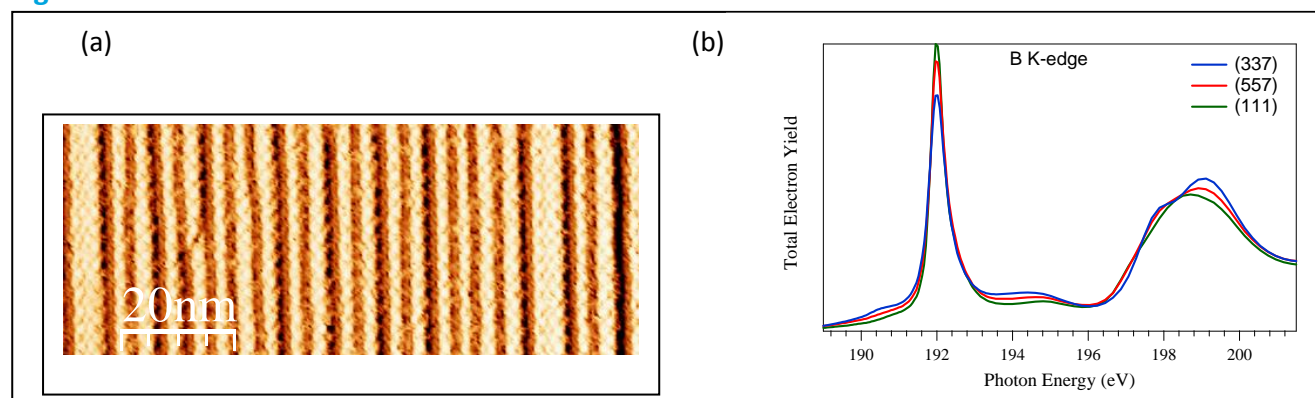
The faceted system on Ni is defined by step-free h-BN/Ni(1 1 1) terraces alternating with strongly tilted h-BN/Ni(1 1 5) or h-BN/Ni(1 1 0) nanostripes, depending on whether we have A-type or B-type vicinal surfaces, respectively. Such deep substrate self-organization is explained by both the rigidity of the h-BN lattice and the lack of registry with Ni crystal planes in the vicinity of the (1 1 1) surface. The analysis of the electronic properties by photoemission and absorption spectroscopies reveal a weaker h-BN/Ni interaction in (1 1 0)- and (1 1 5)-oriented facets, as well as an upward shift of the valence band with respect to the band position at the h-BN/Ni(1 1 1) terrace [1].

h-BN growth on stepped Rh leads to a transformation of the two-dimensional “nanomesh” structure [2] characterized by hole and wire areas to a formation of h-BN nanoribbons where the width of the nanoribbon is tunable by the substrate vicinal angle. We find faceting of the substrate into (1 1 2) and (1 1 3) surfaces, where interaction with the Rh substrate increases (contrary to Ni). Furthermore h-BN band gap openings due to the limited nanoribbon width are observed.

### References

- [1] L Fernandez et al. 2D Mater. 6 (2019) 025013.
- [2] M. Corso et al. Science 303 (2004) 217.

### Figures



**Figure 1:** (a) STM image of hBN nanoribbons at Rh(557), (b) X-ray absorption spectra at the boron K-edge of a h-BN film away from the Rh(111) position of the curved crystal revealing the stronger substrate interaction.