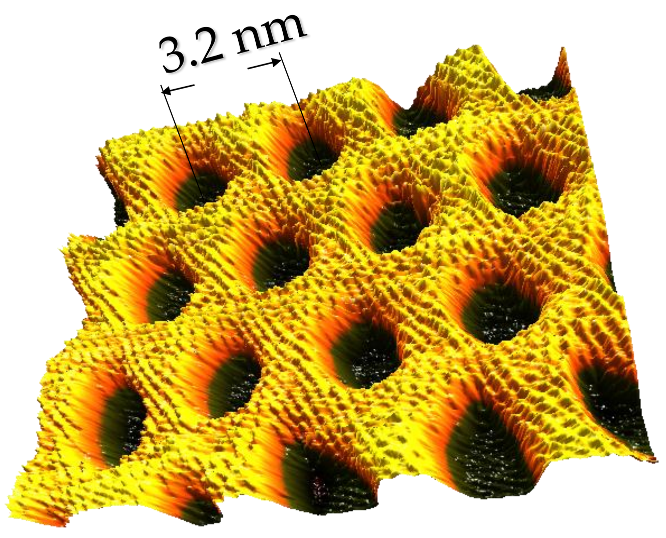

h-BN/Rh(111) nanomesh [1]

Single Layer Boron Nitride Growth and Transfer on 4 Inch Wafers

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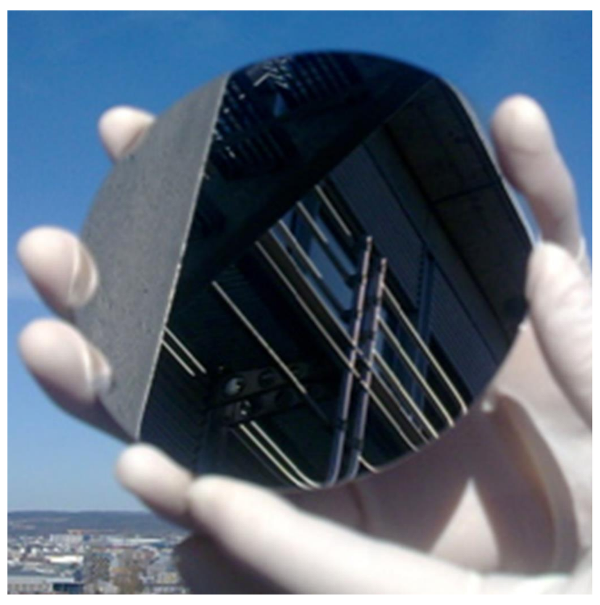
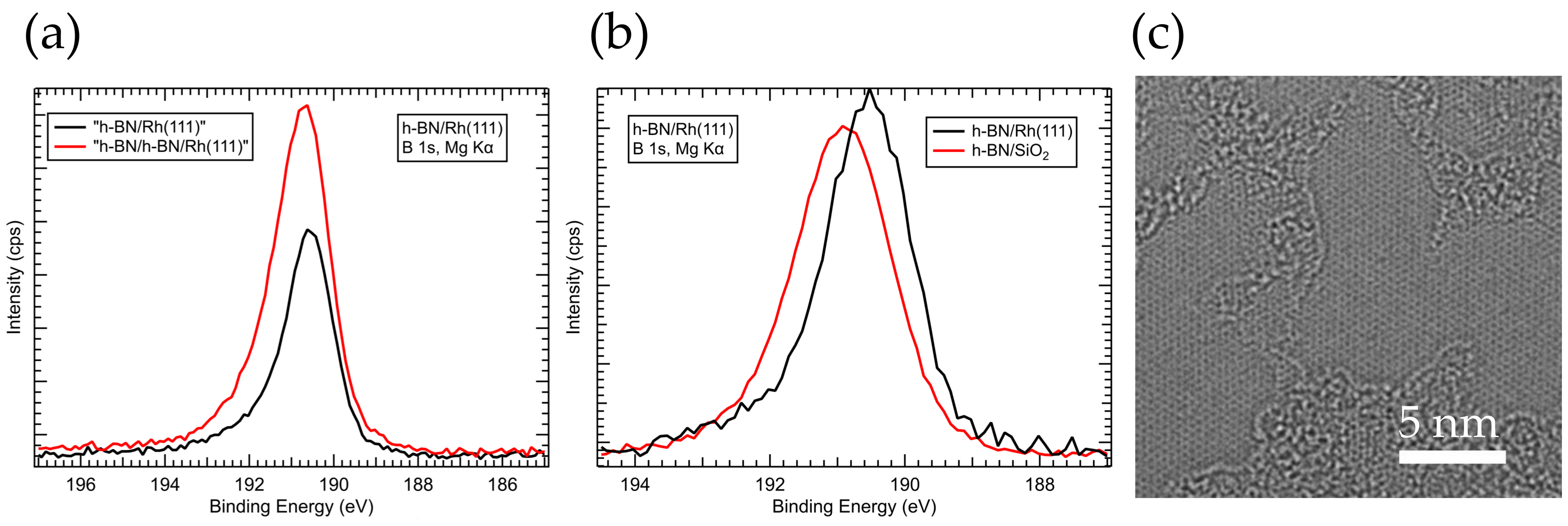


h-BN/Rh(111) 4 inch wafer [2]

Introduction

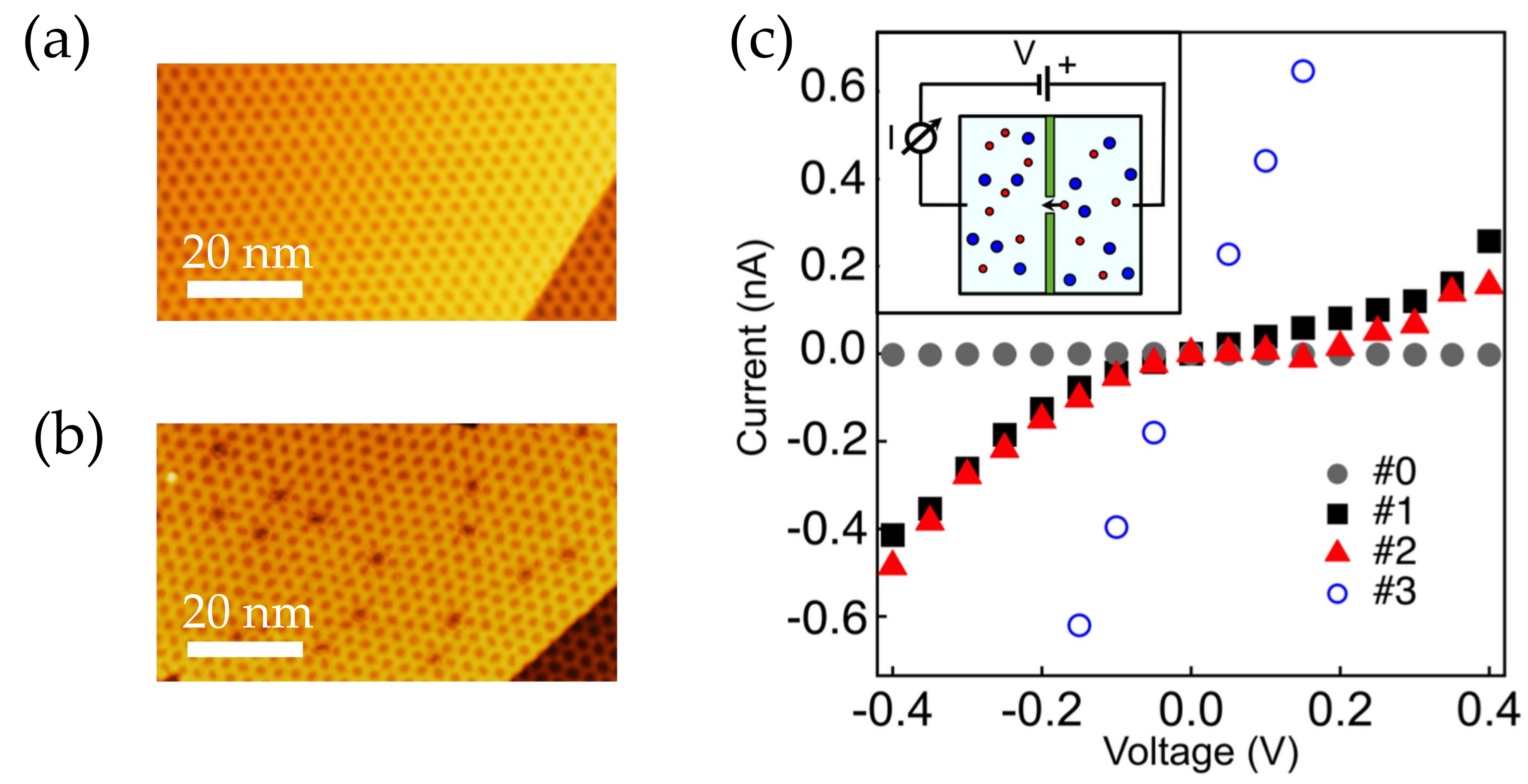
h-BN is a wide band gap insulating two-dimensional material, a promising candidate for substrates of graphene-based electronics and for ultimate thin membranes. On earth it has no natural abundance, we achieve single crystalline and single layer h-BN by UHV-CVD processes on 4 inch wafers. The vacuum facility is located in a cleanroom, which allows to fabricate state of the art h-BN devices with unmatched cleanliness. The high quality of the materials is fully determined by surface sensitive spectroscopic methods located in our lab.

Delaminated h-BN



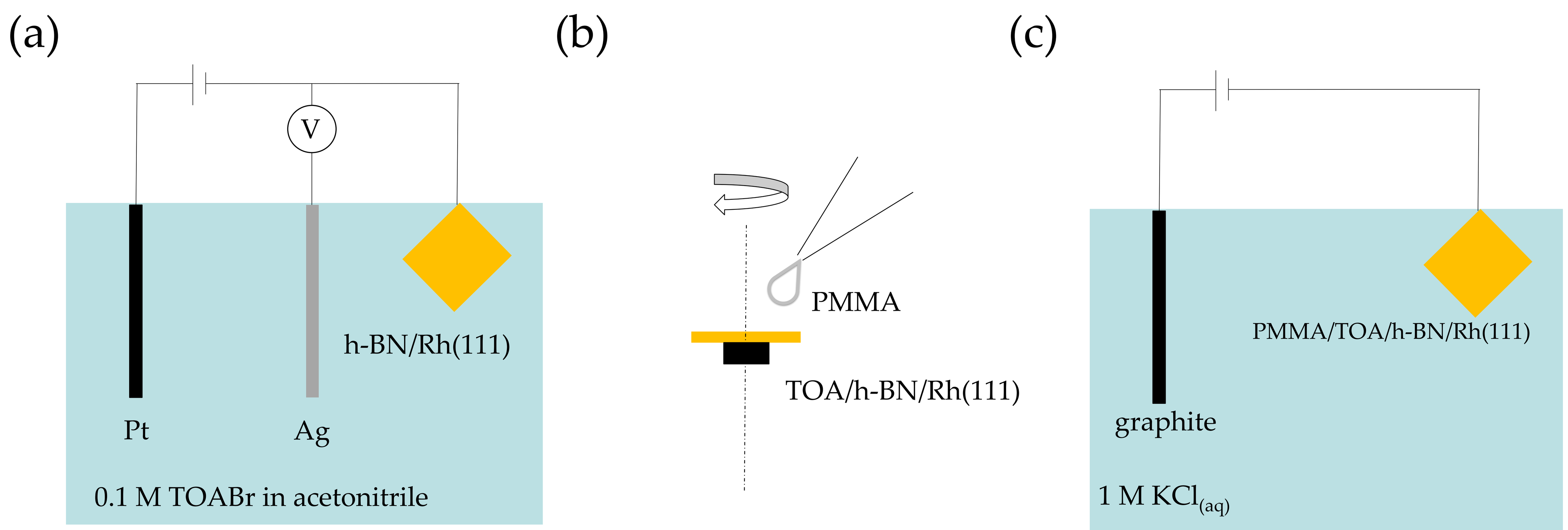
(a) B1s core level XPS spectra before and after transfer to a pristine h-BN/Rh(111) sample. The increase of intensity indicates a successful transfer.
(b) B1s core level XPS spectra before and after the transfer to a SiO_2. The spectra, measured with the same parameters, demonstrate a transfer rate of 95%. [5]
(c) Spherical aberration (Cs) corrected TEM of delaminated h-BN at 80 keV electron energy. [5]

Ion Conductivity of h-BN Membranes



(a) and (b) STM image of the h-BN/Rh(111) before and after "can-opener" treatment, which leads to 2nm voids in the h-BN. [6]
(c) Ion conductivity in 10 mM KCl through a 50×50 nm^2 single layer h-BN membrane. The conductance of the KCl solution and the void dimensions allows to assign a discrete number of holes to each measured membrane. [5]

Wet Chemical Transfer

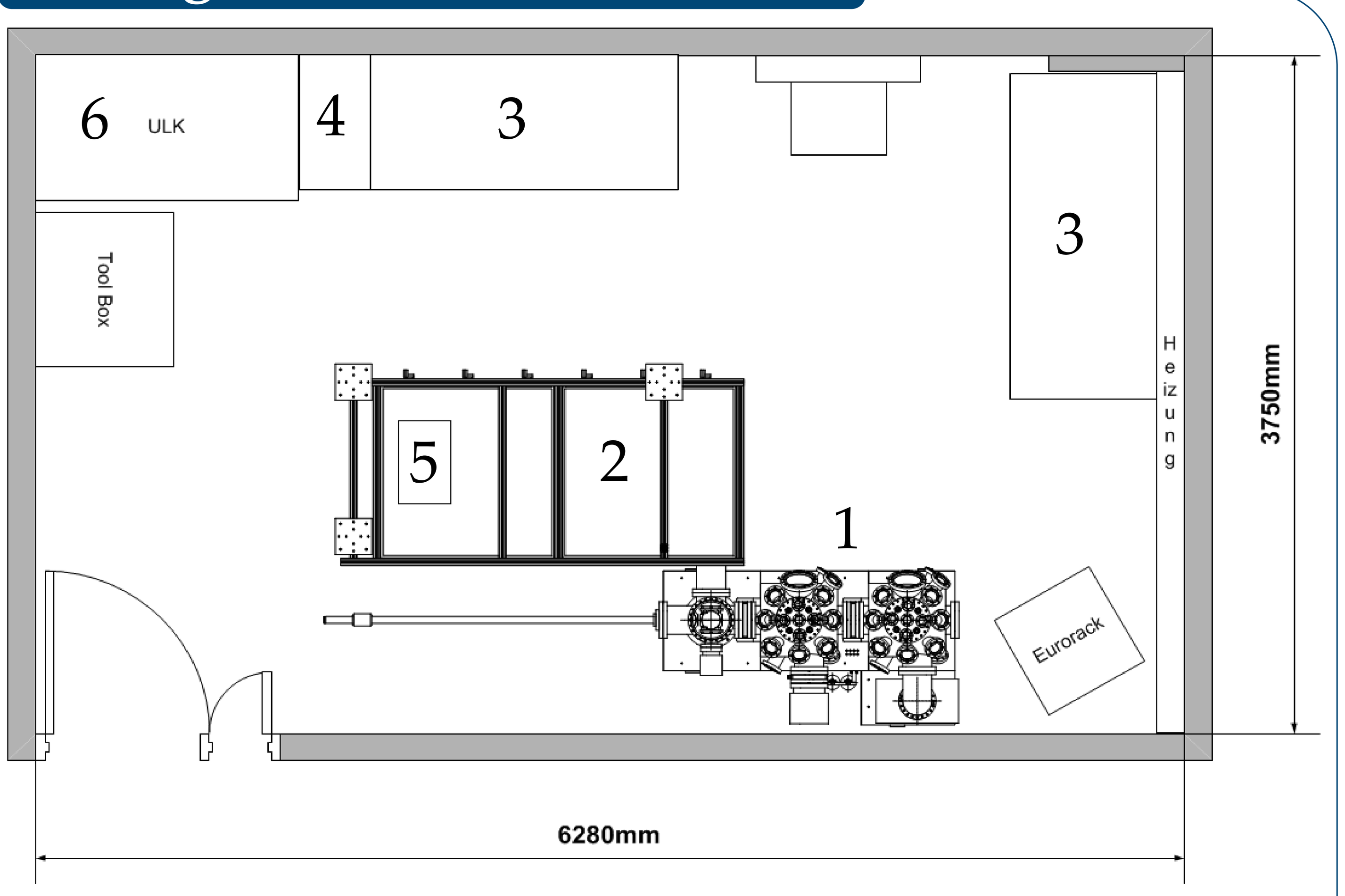


(a) Tetraoctylammonium bromide (TOA Br) treatment of the h-BN/Rh(111) sample using a three-electrode setup. The sample is the working electrode, Pt acts as the counter electrode and the Ag wire is used as reference electrode. [4]

(b) The TOA/h-BN/Rh(111) sample is spin coated with PMMA, which is needed as a support layer.

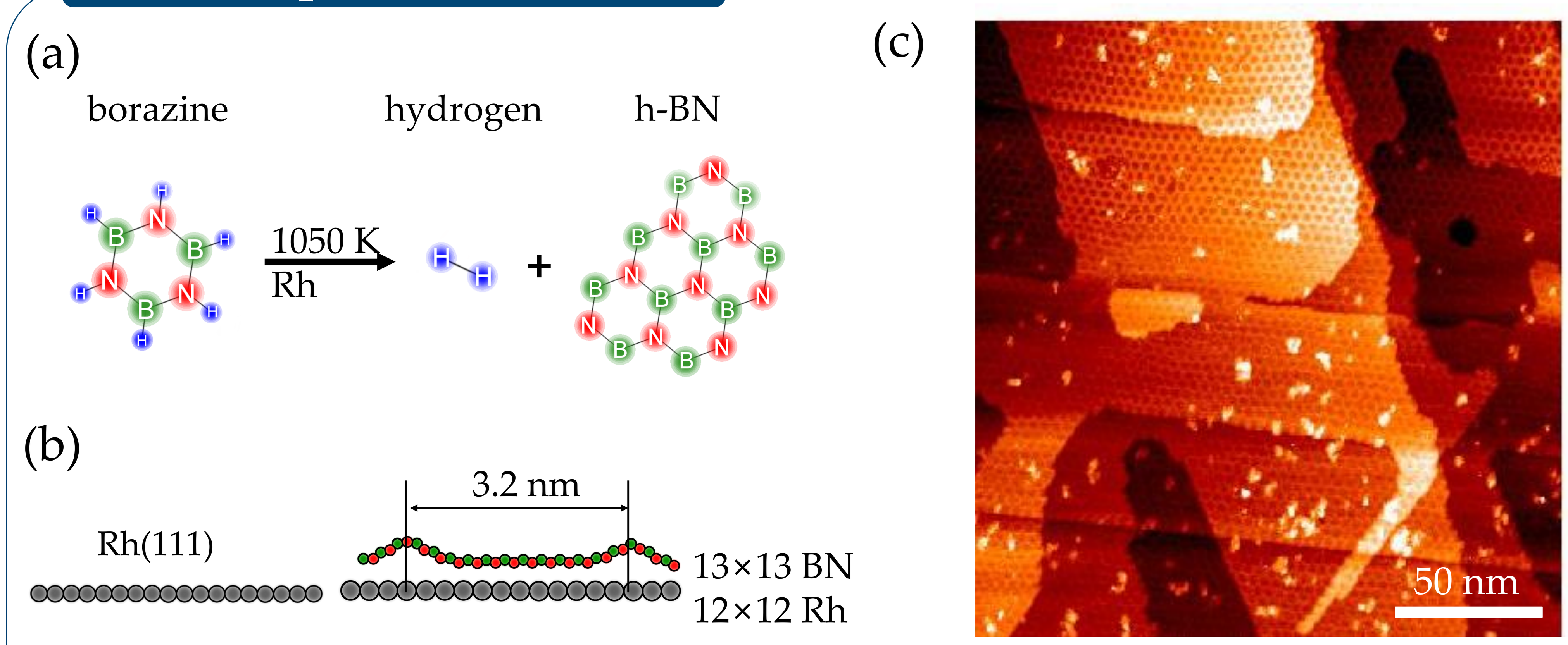
(c) Electrolysis driven delamination of the PMMA supported h-BN single layer. The layer is lifted by the evolution of H_2 bubbles at the interface between h-BN and Rh(111).

Sinergia Cleanroom



1. Sinergia chamber
2. Laminar flow
3. Working tables
4. Plasma cleaner
5. Optical microscope
6. Air conditioner

h-BN Preparation



(a) Decomposition of borazine to hydrogen and h-BN on the Rh(111) surface. [1,2]
(b) Corrugation of the h-BN due to the lattice mismatch between Rh and BN. [1,3]
(c) Scanning tunnel microscopy image of a h-BN/Rh(111) sample.

References and Acknowledgements

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[6] H. Cun *et al.*, Nano Lett. 13, 2098 (2013)

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