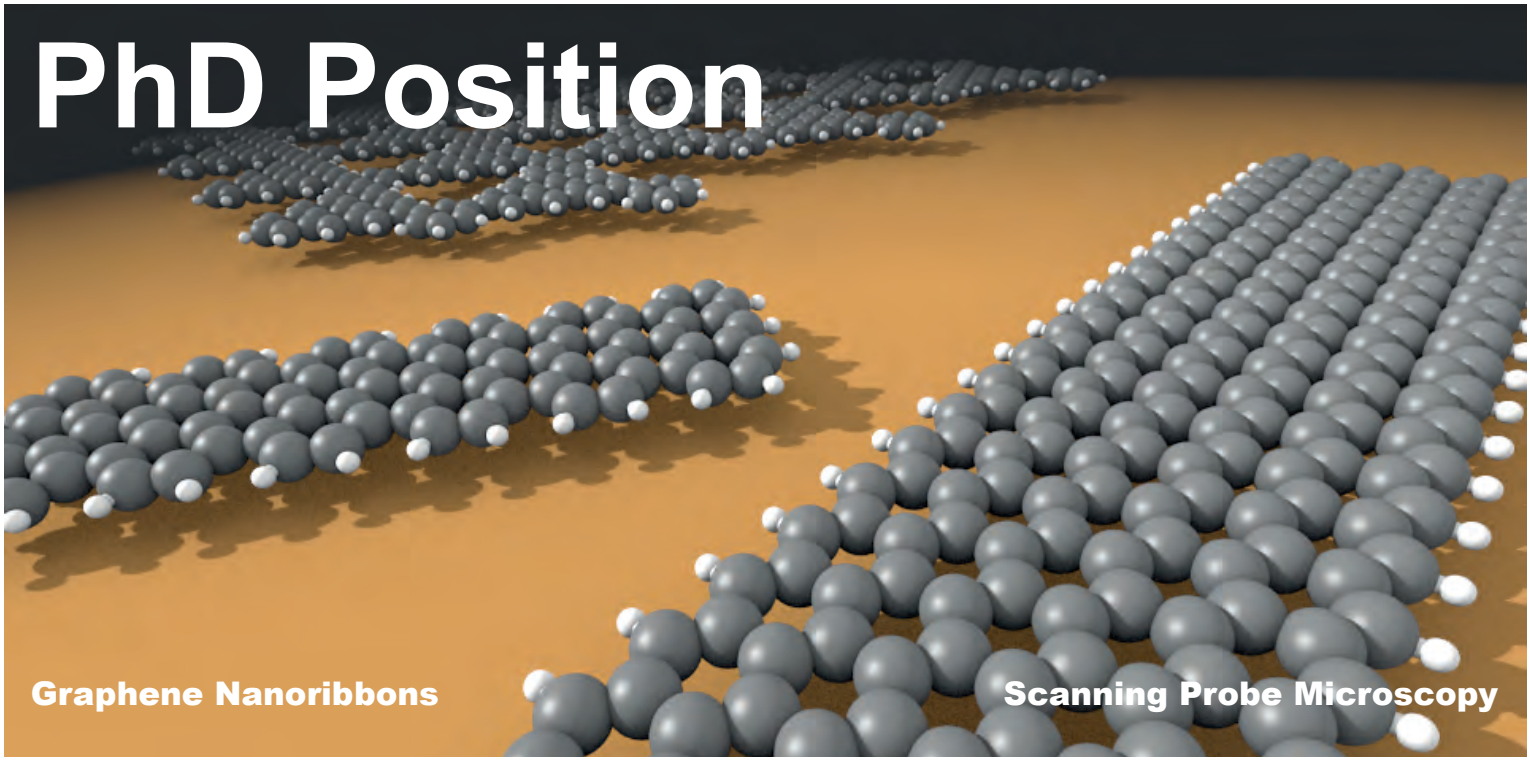
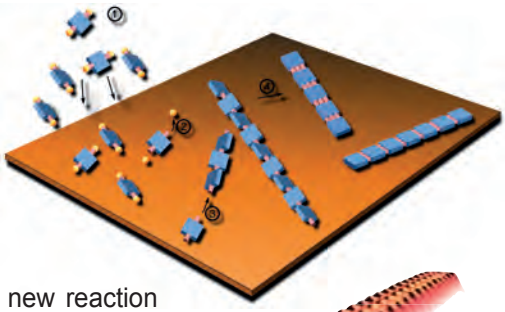
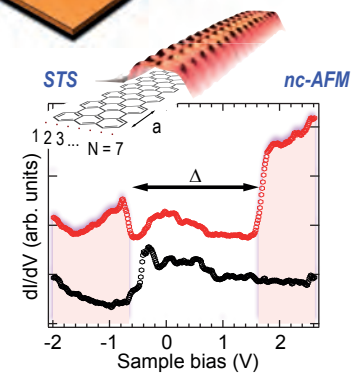
PhD Position



Graphene Nanoribbons
for Electronic Applications





Graphene nanoribbons (GNRs) - ultra-narrow stripes of graphene - have emerged as promising components for future electronic applications. We have recently developed a bottom-up surface chemical method to assemble such nanoribbons piece-by-piece from suitably designed molecular building blocks [*Nature* **466**, 470 (2010); *Nature Nanotech.* **9**, 896 (2014)] and confirmed that width and edge topology can be controlled with ultimate precision [*Nature* **531**, 489 (2016); *ACS Nano* **11**, 1380 (2017)], which allows controlled tailoring of the GNR's electronic and optical properties [*ACS Nano* **6**, 2020 (2012); *Nature Comm.* **5**, 4253 (2014); *Phys. Rev. B* **91**, 045429 (2015)]. Within this activity, we offer two PhD positions.

The first PhD project deals with the bottom-up growth of novel GNR topologies and related graphene nanostructures, and their characterization using scanning tunneling microscopy (STM) and angle-resolved photoelectron spectroscopy (ARPES). A main focus will be set on understanding the reaction mechanisms of on-surface synthesis and the exploration of new reaction schemes. In order to establish clear structure-property relationships, scanning tunneling spectroscopy (STS) measurements will be complemented by ultimate resolution non-contact AFM (nc-AFM) characterization.

The second project deals with the optimization of protocols allowing transfer of GNR films from their metallic growth substrate to insulating substrates that are suitable for optical characterization and device fabrication. Based on this key step in the exploitation of GNR properties, the successful PhD candidate will focus on ex situ structural, optical and transport characterization of GNR samples and devices, in close collaboration with external project partners. The main characterization methods applied will be multi-wavelength Raman spectroscopy, scanning probe methods (STM/AFM), XPS and optical absorption spectroscopy.

We are looking for highly motivated PhD candidates with a strong background in Physical Chemistry, Materials Science or Surface Science to take up a challenging PhD position in a materials research institution in the Zurich area with outstanding infrastructure and broad interdisciplinary surroundings.

Required qualifications: Masters degree in physics, chemistry or materials sciences, solid background in surface science, very good communication skills.
For further information please contact: Prof. Roman Fasel (roman.fasel@empa.ch), Head of nanotech@surfaces Laboratory

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