SUMMER INTERNSHIPS 2016

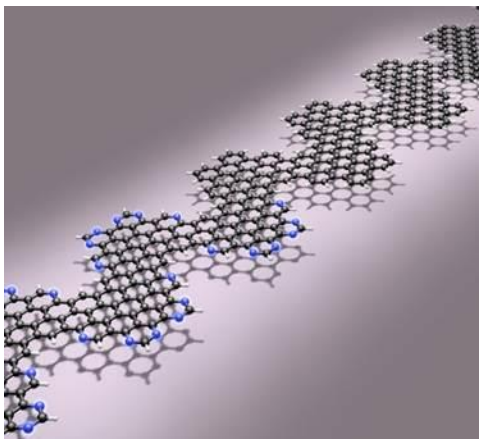
TITLE: The graphene TETRIS: bottom-up assembly of graphene stripes

DESCRIPTION (Objectives, tasks, materials, equipment…):

Graphene is a new two-dimensional material with exceptional electronic and mechanical properties. Graphene is a semimetal, what makes it ideal to transport electrons. However, in many current devices, a semiconductor is mostly appreciated. A trick to turn graphene semiconducting is to cut in stripes with finite size. This leads to the opening of an electronic band-gap of energy dependent on the width of the stripe.

The goal of this research study is to construct graphene stripes (nanoribbons) using a recently discovered method: the assembly of small bricks of graphene directly deposited on the surface of a metal. This graphene Tetris allows defining the shape and size of the nanoribbons by selecting the shape of starting bricks of graphene (precursors).

The student will explore novel nanoribbons assembly strategies using a Scanning Tunneling Microscope (STM) at low temperature (4K) and in ultra-high vacuum. With this microscope the student will first visualize the graphene precursor bricks, and follow the different Tetris-steps, as well as identify the structure of the resulting nanoribbon. Second, he/she will also employ scanning tunneling spectroscopy (STS) to investigate the electronic configuration of the nanoribbon, determining the position of the electron bands and the width of the band-gap.



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SUITABLE FOR: chemists, physics