UFR de Chimie

Master Molécules, Matériaux, Surfaces

université PARIS DIDEROT PARIS 7

Séminaire de Chimie Autour des Nanosciences

OLIVIER PLUCHERY

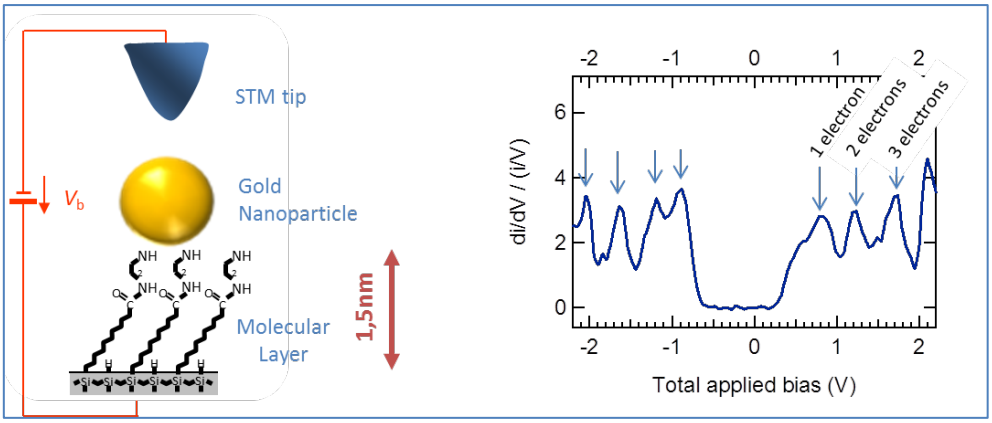
Université Pierre et Marie Curie, Institute for NanoSciences in Paris

Donnera une conférence sur le thème :

GOLD NANOPARTICLES AND ORGANIC LAYERS ON SILICON FOR NANO-ELECTRONICS

Gold nanoparticles can be used as ultimate electrical materials that store electrons or control their flow for the next generation nano-electronic devices. These particles are the core element of assemblies where the electrical current is reduced to the smallest possible since electrons are controlled one by one by using the Coulomb blockade phenomenon. We prepared colloidal gold nanoparticles of 6 nm and grafted them on highly ordered molecular layers on silicon (see Fig). A perfect control of the morphology is necessary to achieve a real control of the electronic behaviour. In particular, we have prepared a highly ordered monolayer of alkyl molecules by hydrosilylation from alkene molecules and subsequently modified the layer with an amine group so that gold nanoparticles can be firmly immobilized on top of the layer. A wide range of characterization methods were used to assess the preparation: AFM, STM, Scanning Tunnel Spectroscopy (STS), High Resolution-TEM, XPS, surface sensitive Fourier Transform Infrared spectroscopy and surface sensitive UV-visible spectroscopy.

This architecture results in a tunnel junction (silicon-Molecule-Nanoparticle) where the molecules act as a tunnel barrier (thickness 1.5nm). By placing an STM tip above a nanoparticle a double barrier tunnel junction (DBTJ) is created and the number of electrons simultaneously stored in the nanoparticle is controlled by the STM bias through to the so-called Coulomb blockade effect (see Figure). This effect allows placing one, two, three, etc. extra electrons in the nanoparticle and is aimed at building single electron memories or single electron transistors. We were also able to reveal the spontaneous charging behaviour of these metallic nanoparticles on our organic layer.



LE VENDREDI 28 Novembre À 11H00

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