**Field:** Physics

**Doctoral School**: SMD-Science de la Matière **Programa de doctorado:** Doctorado en Física

**Title**: ON-SURFACE SYNTHESIS ON FUNCTIONAL SURFACES

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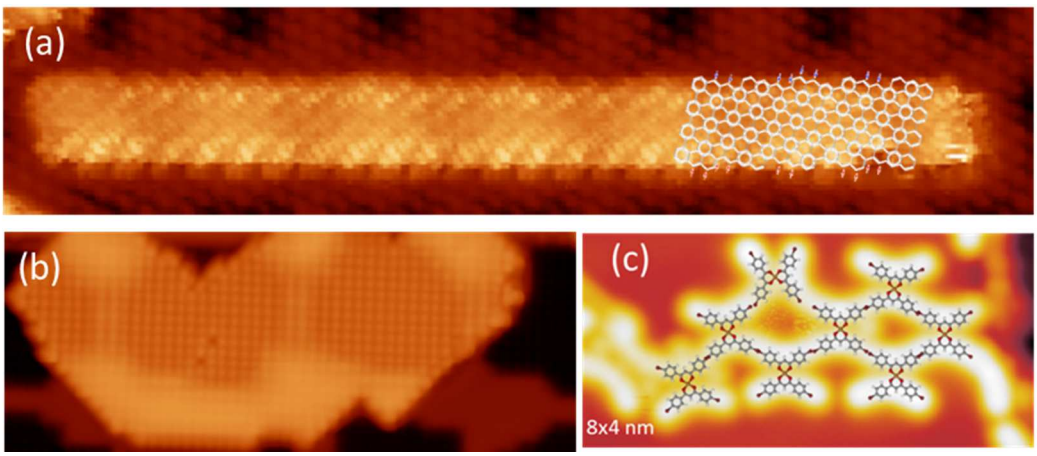
**Keywords**: On-surface-synthesis, functionalized molecules, optoelectronic properties, spin coupling, scanning probe microscopy and spectroscopy.
**Area**: Nanoscience and Nanotechnology
**Funding**: POCTEFA Interreg project nºEFA194/16/TNSI
**Starting date**: 01.02.2018
**Ending date**: 31.01.2021

Covalently liked metal-organic structures are the building block of future molecular electronics. When its precursor constituents are deposited on a substrate, they are still weakly bonded to one another. The aim here is to transfer the flexibility of organic chemistry to the 2-dimensiona benchmark imposed by an atomically clean surface, to create 2D and 1D covalently linked nanostructures with designated functionality. On top of the catalytic role played by the surface, one of the main advantages of this technique is its compatibility with the most precise and powerful surface science methods: scanning probe microscopy and electron spectroscopies. This so-called on-surface synthesis method [1-4] made possible, for example, to create nanoribbons of graphene on several substrates with atomic scale control of its structure and physical properties. These molecular layers hold great interest for devices based on organic electronics such as OLEDs type screens. But the state-of-the-art reaction pathways are limited to metallic surfaces, where the electronic transport properties of the nanostructures are shortcut by the substrate itself. In the course of this PhD, we will focus on creating covalent nanostructures on top of functional surfaces, as for instance insulating MgO, $SrTiO_3$ or magnetic surfaces. An example of the formation of such covalent networks is shown in the image below, exemplifying the feasibility of on-surface synthesis on (a) ferromagnetic Gd-Au alloys, (b) ferroelectric NaCl ultrathin films and (c) metallic Au(111) surface.



This research work will be carried out by local probe microscopies (STM and non-contact AFM) which not only allow to study the structure of molecular networks and reaction paths but also the resulting electronic and magnetic properties. So far, few studies have been done on insulator [5-8]. The first part of the study will therefore be conducted on a conductive metallic substrate and the second on ultra-thin films grown on metal surfaces.

**Collaborations**: The selected candidate will be contracted during 3 years to complete a PhD thesis, and will receive a double doctoral degree by University of Zaragoza and Université Paul Sabatier (Toulouse). The contract will be signed during 1.5 years with each institution, with a net salary of 1150 €/month in Zaragoza and 1600 €/month (before taxes) in Toulouse. The PhD fellow will have the opportunity of performing research stays at SMEs commercializing Scientific Instrumentation that are partners of the TNSI funding project, as well as access to the ALBA synchrotron light source.

**References**:

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