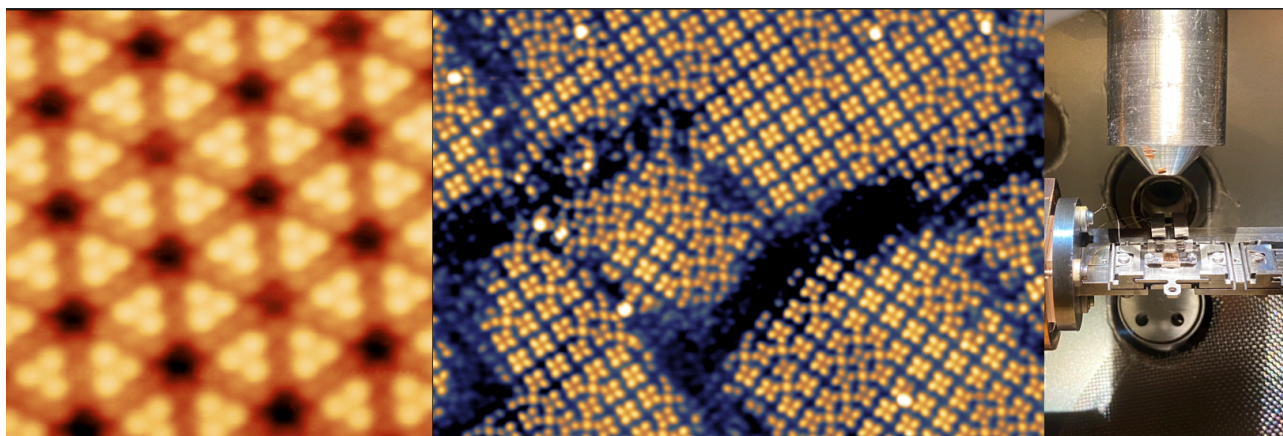


Electronic and structural characterization of nanostructured surfaces at the atomic scale



The exploitation of renewable energy sources strongly relies on the development of technologies capable of converting and storing green energy more efficiently. For this reason, nanostructured surfaces are a very promising field of research, as they offer the possibility of tailoring electronic and structural properties to enhance the optical, electronic and chemical performance of devices' components. In particular, the combination of conductive or semi-conductive 2D materials with metalorganic molecules acting as single-atom catalysts is extremely promising for realizing functionalized surfaces suitable for e.g. gas sensing devices, solar cells and high-energy-density rechargeable batteries.

In this framework, the STRAS laboratory (Surface sTructure and Reactivity at the Atomic Scale) proposes to investigate the properties of model devices composed by heterostacks of selected 2D materials and metalorganic molecules by means of Low-Temperature Scanning Tunneling Microscopy and Spectroscopy. The experimental apparatus can probe nanostructured surfaces with atomic resolution at low temperature (4 K), directly extracting local information on the electronic density of states and on the vibronic characteristics of adsorbed molecules. The experimental activity aims at characterizing the geometric structure and the electronic properties of 2D materials (graphene, phosphorene, borophene) and nano-porous frameworks of metalorganic molecules (tetrapyrroles), and at determining the interplay effects when they are combined. Then, the catalytic activity of such systems will be tested *in situ* by direct exposure to selected gases (e.g. O₂, NO₂), to gain insight into the properties relevant for the creation of future devices.

In this project, PhD students will have the opportunity of:

- a) learning to operate independently the experimental apparatus;
- b) profiting from scientific interactions with national and international collaborators;
- c) bringing their own original contribution to the research activities with the possibility of devising and developing experimental proposals to access external scientific facilities to complement their doctoral thesis.

Contacts

Prof. Giovanni Comelli, University of Trieste gcomelli@units.it

STRAS staff

Dr. Cristina Africh, CNR-IOM

Dr. Alessandro Sala, CNR-IOM

For further information, please visit the STRAS website <https://www.iom.cnr.it/research-facilities/facilities-labs/analytical-microscopy-and-spectroscopy/stras/>