Thesis Proposal for the Master's Degree in Physics

Gruppo "Superfici e Energia"

Ref. Prof. Raffaele G. Agostino

The Surface and Energy research group at the University of Calabria, led by Raffaele G. Agostino, focuses on studying materials with innovative chemical-physical properties for both fundamental and applied purposes, such as energy and electronics. The team, consisting of researchers and collaborators, utilizes **advanced spectroscopic and microscopic techniques** (HREELS, XPS, UPS, SEM, etc.) to characterize surfaces and interfaces. Currently, they are involved in building the **STAR X-ray source** for advanced microtomography and spectroscopy studies. Their main research areas include gas adsorption in nanostructured materials, the characterization of self-assembled molecular layers, the analysis of two-dimensional systems like graphene, and the development of advanced tomographic imaging techniques. Additionally, the group contributes to the **DeltaH laboratory** for hydrogen storage solutions and conducts pioneering research in **virtual histology** using **artificial intelligence** techniques for tissue analysis.

Title:

Structural and electronic properties of two-dimensional molecular systems.

Abstract:

The synthesis and design of two-dimensional supramolecular assemblies with specific functionalities is one of the principal goals of the emerging field of molecule-based electronics, which is relevant for many technological applications. By means of scanning tunneling microscopy, photoemission spectroscopy and low-energy electron diffraction measurements supported by density functional theory calculations we investigate the structural and electronic properties of several molecular pattern with metallic center deposited on noble metal atom surfaces form a self-limited highly ordered and defect-free two-dimensional single-layer film of micrometer-size, which exhibits a nearly-freestanding character.

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Laboratory where the thesis is carried out:

LSAM-STAR research infrastructure

Type of thesis:

Experimental and data analysis