

Training Program

Programa de formación previsto en el contexto del proyecto solicitado.

The training plan has **six** main elements: PhD program, introduction to the Nanoscience and nanotechnology fields, interactions with other scientists, participation and organization of scientific conferences, short stays in renown international centers and the PhD project.

PhD program. The graduate student will join the PhD program of the Universidad Autónoma de Madrid ‘Doctorado en física de la Materia Condensada, Nanociencia y Biofísica’.

Introduction to Nanoscience. The training plan includes the introduction to atomic force microscopy, nanomechanics, force spectroscopy methods including single-molecule, single-cell and nanomechanical spectroscopies; handling of biomolecular samples; nanolithography processes and techniques including scanning probe lithography, optical lithography, and the use of clean room facilities. It also includes the teaching of some basic scientific abilities such as problem-solving skills, smart use of scientific data basis, how to present scientific data and how to write a scientific paper.

Interactions with scientists. The training also involves the exposure to a dynamic and **international** scientific environment, the participation in scientific conferences and workshops and the organization of scientific meetings (projects, workshops and conferences). On a weekly basis, the group receives the visit of senior scientists, post-docs or graduate students from abroad or other Spanish research centers. The group participates in 4 scientific networks covering a variety topics ranging from mechanobiology to nanolithography (<http://unizar.es/nanolito/>). In addition, the ICMM and the **UAM-CSIC** campus of excellence provides a rich, diverse and stimulating scientific environment to develop the passion for science and knowledge.

The group **organizes** the Multifrequency AFM conference series. The 9th Multifrequency AFM Conference will be held in Madrid (14-16/06/2013). More than 1000 scientists have attended the previous conferences. All the Multifrequency AFM conferences were held in Madrid. <https://wp.icmm.csic.es/multifrequency-afm/>.

Visits to International centers. Several short stays are planned in the following laboratories

-Prof. Mingdong Dong, Aarhus University (Denmark) <https://inano.au.dk/about/research-groups/bio-spm-group-mingdong-dong>

-Prof. Takeshi Fukuma at the Nano Life Science Institute (NanoLSI, Univ. of Kanazawa, Japan). Currently, the PI is a member of the International Advisory Board of the NanoLSI (<http://fukuma.w3.kanazawa-u.ac.jp>).

Publicaciones recientes del director de la tesis en el tema

Para saber más: <https://wp.icmm.csic.es/forcetool/>

•Ricardo Garcia, Interfacial liquid water on graphite, graphene, and 2D materials. *ACS Nano* 17, 51-69 (2023).

•Diana M. Arvelo, Manuel R. Uhlig, Jeffrey Comer, R. Garcia. Interfacial layering of hydrocarbons on pristine graphite surfaces immersed in water. *Nanoscale* 14, 14178-14184 (2022).

- Manuel R. Uhlig and Ricardo Garcia. *In Situ* Atomic-Scale Imaging of Interfacial Water under 3D Nanoscale Confinement. *Nano Letters* **21**, 5593-5598 (2021).
- Simone Benaglia, M.R. Uhlig, J. Henández-Muñoz, E. Chacón, P. Tarazona, R. Garcia. Tip Charge Dependence of Three-Dimensional AFM Mapping of Concentrated Ionic Solutions. *Phys. Rev. Lett.* **127**, 196101 (2021). Editor's choice (December 2021).
- Victor G. Gisbert, S. Benaglia, M.R. Uhlig, R. Proksch, R. Garcia. High-Speed Nanomechanical Mapping of the Early Stages of Collagen Growth by Bimodal Force Microscopy. *ACS Nano* **15**, 1850 (2021).
- R. Garcia, Nanomechanical mapping of soft materials with the atomic force microscope: methods, theory and applications, *Chem. Soc. Rev.* **49**, 5850-5884 (2020). Times cited: **154**.
- Manuel R. Uhlig, S. Benaglia, R. Thakkar, J. Comer, R. Garcia, Atomically resolved interfacial water structures on crystalline hydrophilic and hydrophobic surfaces. *Nanoscale* **13**, 5275-5283 (2021).
- M. R. Uhlig, D. Martin-Jimenez, R. Garcia. Atomic-scale mapping of hydrophobic layers on graphene and few-layer MoS₂ and WSe₂ Times cited in water. *Nature Commun.* **10**, 2606 (2019).