TRABAJO DE FIN DE MÁSTER

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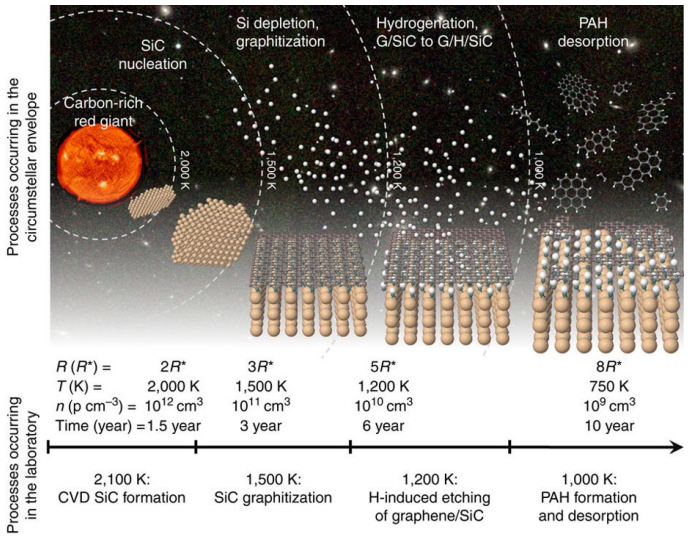
Atomic-scale characterization of interstellar dust analogues.

Short description of the project:

In recent years we have witnessed a clash between astrophysics and nanotechnology. Atomic-scale interactions govern the formation of the diverse products observed in planetary nebulae, protoplanetary discs' or in meteorites but not much is known of astronomically relevant reactions at the nanoscale. In this TFM we propose the exploration of interstellar and circumstellar processes using a multidisciplinary experimental approach. The student will grow interstellar dust analogues using the unique Stardust machine -which simulates the conditions of a red-giant star in the laboratory [1]- and study their structure and reactivity towards other chemical species abundant in the space- prominently aromatics which may be relevant for the origin of life [2]. For that purpose, the student will profit from a set of in-house state-of-the-art experimental techniques including ultra-high vacuum scanning tunneling microscopy, photoelectron spectroscopies and thermal programmed desorption, and will work in close collaboration with astronomers. This multidisciplinary and multitechnique TFM will provide a basic formation on the emerging field of laboratory astrophysics.



References:

[1] Precisely controlled fabrication, manipulation and in-situ analysis of Cu based nanoparticles" L. Martínez, K. Lauwaet, G. Santoro, J. M. Sobrado, R. J. Peláez, V. J. Herrero, I. Tanarro, G. J. Ellis, J. Cernicharo, C. Joblin, Y. Huttel, J. A. Martín-Gago, Scientific Reports 8, (2018) 7250.

[2] Graphene etching on SiC grains as a path to interstellar polycyclic aromatic hydrocarbons formation, P. Merino, M. Švec, J.I. Martinez, P. Jelinek, P. Lacovig, M. Dalmiglio, S. Lizzit, P. Soukiassian, J. Cernicharo, J.A. Martin-Gago. Nat. Commun. 5, 3054 (2014)