Intercalation is the insertion of guest species between the layers of graphite or another van der Waals layered crystal. The process is accompanied by a change in the charge carrier density and by the expansion of the interlayer distance, which profoundly modify the electronic band structure of the layered material. As a result, correlated electronic phases, such as superconductivity and magnetism, often emerge in intercalated compounds.
While the most common guest species are alkali metals, the intercalation of organic ions is particularly interesting. Indeed, organic molecules can provide additional functionalities to the layered materials, introducing novel optical and magnetic responsivity. Examples can be found in our recent works: ***Nanoscale****, 14, 1165 (2022);* ***Adv. Funct. Mater.*** *32, 2208761 (2022).*

In this project, the Master student will explore the intercalation of bulk and atomically thin layered crystals, and the emergence of magnetism and superconductivity in the so-obtained compounds.
The intercalation will be monitored through X-ray diffraction, Raman spectroscopy and atomic force microscopy. Nanoscale devices will be fabricated to study the electrical transport properties of pristine and intercalated layered materials and the emergence of the strongly correlated phases.

We offer an international and competitive environment, state-of-the-art equipment (including a class 100 cleanroom for nanofabrication capabilities), and the possibility of performing research at the highest level.

Figure 1. *This project explores how the properties of layered materials are altered by the intercalation of organic molecules (schematically shown as red balls).*

Description of the research group:

CIC nanoGUNE's Nanodevices Group is mainly interested in the electronic properties of low-dimensional systems. Our research focuses spintronics, multifunctional devices and advanced nanofabrication. For more information, see our website at https://www.nanogune.eu/nanodevices

Application:

If you are a master student and you are interested in this project, please get in touch with the scientist in charge: **Luis Hueso (l.hueso@nanogune.eu).**

To apply for a **master scholarship**, fill in the form below and follow the instructions and recommendations of the general call **open until 30 June 2023**.

NOTES:

(i) All applicants will receive an answer after the end of the selection process; but please note that due to the large number of submissions that are expected, we cannot provide individual feedback.

(ii) Additional information about nanoGUNE's commitment towards HR excellence in Research and Gender Equality are available on our website.

(iii) We encourage you to subscribe to our HR mailing list to receive information related to nanoGUNE's open positions and open calls for different training and talent attraction programs.