## *Development of high-strength nanostructured multilayers for applications in nuclear reactors*

PhD in Experimental Condensed Matter at the National Research Council – Institute of Materials (https://www.iom.cnr.it/) in Trieste, Italy in collaboration with the energy company ENI (https://www.eni.com/).


In nuclear fusion reactors, the first-wall materials are those most exposed to extreme conditions due to their direct exposure to plasma, and must withstand various physical and chemical stresses. These include the implantation of the fuel particles and the release of atoms of the first-wall material through the sputtering process, phenomena that heavily influence the duration of the reactor operation. If the intrinsic physical-chemical properties of a material can allow a first choice for the first-wall material, it is also known that the surface morphology has a great influence on the efficiency of erosion due to sputtering and on the consequent duration of the components, however this point is still poorly investigated in the context of nuclear fusion.
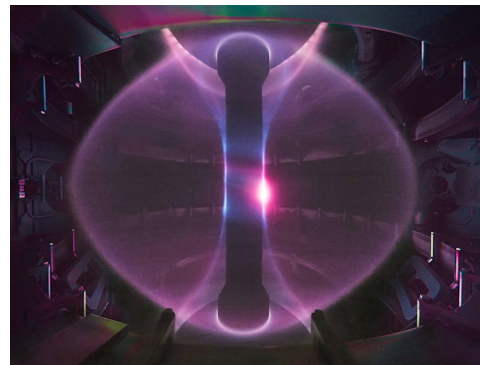
This PhD project aims at the synthesis and study of nano-structures of controlled and reproducible size and morphology, to identify the best conditions needed for minimizing the sputtering processes occuring in a nuclear fusion reactor. It is planned to develop processes for the nano-structuring by means of both top-down and bottom-up techniques of carbon-based substrates (graphite), which will be covered with thin tungsten films. This two materials (graphite-tungsten) has been currently identified as one of the best and most likely combinations for use in nuclear fusion reactors. The work will include the structural and electronic characterization, before and after plasma exposure, of the obtained nanostructures using the many state of the art experimental techniques available in IOM, including scanning electron microscopies (SEM, TEM, XRD, …) and electron spectroscopies (UPS, XPS, Auger, …).

The activity will be carried out in collaboration with experimental groups active in the field and in partnership with the energy company ENI.
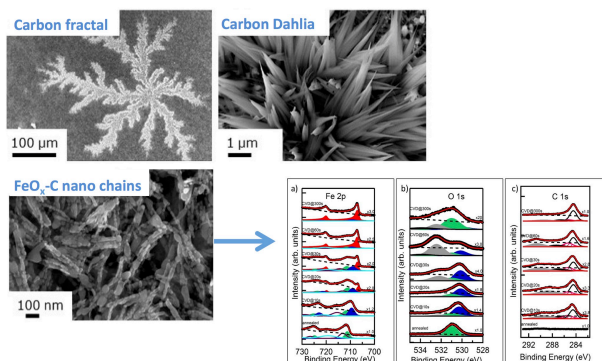
Interested candidates should contact the supervisors of the project, dr. Cinzia Cepek (CNR-IOM, cepek@iom.cnr.it), and dr. Simone Dal Zilio (CNR-IOM dalzilio@iom.cnr.it) for further information.