THE MATERIALS PRODUCTION AND PROCESSING FACILITY AT THE SPANISH NATIONAL CENTRE FOR FUSION TECHNOLOGIES (TECHNOFUSION)

R. Pareja[1], M.A. Monge[1], M.T. Hernandez[2], R. Román[2], M. González[2], I. García-Cortés[2], M. Perlado[3], A. Ibarra[2].

[1] *Departamento de Física, UC3M, Avda de la Universidad 30, 28911 Leganés, Madrid, Spain.*
[2] *LNF-CIEMAT. Avda, Complutense, 22. 28040 Madrid, Spain.*
[3] *IFN, ETSII, UPM, C/José Gutierrez Abascal, 2. 28006 Madrid, Spain*

Corresponding author: rpp@fis.uc3m.es

The key materials in a fusion reactor are those used in the structure of the plasma facing wall, i.e. the blanket and the divertor, structural materials, holding first wall components (vacuum vessel, cryostat, superconductor coils, magnet shield, auxiliary systems for plasma heating and fuelling), and functional materials. Plasma facing components, and others next to the plasma, have to operate under extreme conditions so that the plasma attains the operating parameters to make the fusion reactors profitable devices for energy production. Materials are therefore an urgent issue to be resolved in order to make nuclear fusion an economical and safe energy resource.

Currently, with some particular exceptions, materials with properties satisfying the design conditions required in fusion reactors are only produced on a laboratory scale. Under such circumstances, the research results obtained from materials that are produced in different laboratories usually yield discrepancies due to differences in the composition, fabrication techniques and processing conditions, as well as to a shortage of material for undertaking a rigorous and complete characterization. The lack of research laboratories with the capability to manufacture in a single batch, a quantity of material sufficient for full characterization is evident. The European Program has been suggested the urgent need of developing this capability among the European laboratories. Accordingly, the **Material Production and Processing Facility** (MPP) at the Spanish National Centre for Fusion Technologies (**TechnoFusión**) will try to contribute to this part of the European Fusion Material Program.

This paper will review the state-of-the-art of this under-development facility that will run following these main objectives:

- To produce batches of fusion materials within the framework of the European Program.
- To fabricate batches of structural materials of up to ~50 kg by means of the vacuum induction melting (VIM) technique.
- To produce ODS steels, and ODS and non ODS W alloys by mechanical alloying and consolidation by hot isostatic pressing (HIP) or spark plasma sintering (SPS) techniques.
- To produce nano-structured steels and alloys, or ultrafine grained, via mechanical alloying, HIP and SPS techniques.
- To improve the mechanical behaviour by processing materials using thermo-mechanical treatments and severe plastic deformation techniques.
- To develop coating techniques with W and multifunctional ceramics layers using the vacuum plasma spraying (VPS) technique.