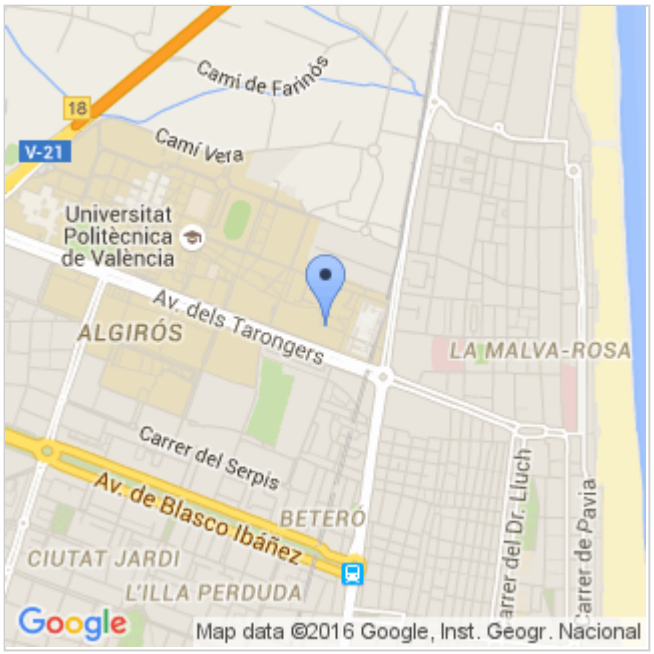
Expression of Interest



Contact Person/Scientist in Charge

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Universitat Politècnica de València (UPV)

Department / Institute / Centre

- **Name:** Instituto de Tecnología de Materiales - Universitat Politècnica de València
- **Address:** Campus de Vera; Camino de Vera, s/n; Valencia (46022)
- **Province:** Valencia

Research Area

- Chemistry (CHE)
- Information Science and Engineering (ENG)
- Physics (PHY)

Brief description of the institution:

Universitat Politècnica de València (UPV) is the single Spanish Technical University that features in the main University world rankings. It is within the top 5 Spanish Universities with the highest revenue from both public research and knowledge transfer activities, and a national leader in patent license income and start up creation. Constituted in 1971, it comprises nearly 30.000 students, over 2500 academics, and 17 university research centres of excellence.

UPV has a relevant experience in the participation in international research programmes, with over 100 FP7 projects and 40 H2020 projects in the period 2014-2015. UPV researchers are also actively involved all H2020 life program stages, from workprogramme drafting discussions, to project coordination. It is also taking part in several major partnering initiatives (JTIs, PPPs, KICs…).

Brief description of the Centre/Research Group (including URL if applicable):

The Institute of Materials Technology (UPV) is formed by ten expert groups in different areas of materials science and engineering (alloys, ceramics and polymers) and including the group for the development of materials by powder metallurgy techniques. The group has capabilities to obtain mixtures of different alloys and compounds with high vacuum sintering and microstructural characterization (XRD, SEM, FESEM, EBSD, FIB, STEM, AFM), mechanical, tribological and against corrosion. The group has capacity to obtain mixtures of different alloys and compounds with high vacuum sintering and microstructural characterization (XRD, SEM, FESEM, EBSD, FIB, STEM, AFM), mechanical, tribological and against corrosion. His work developed in titanium alloys with molybdenum and niobium addition, mainly.

The development of the powders can be accomplished by high energy mechanical mixing and can be arranged in different collaborating centers, spark plasma sintering techniques and applying severe plastic deformation (ECAP and HPT).

The alloys are characterized by potentiodynamic corrosion tests and behavior of biofilm and clinical treatment, with biocompatibility tests.

Project description:

Development of low modulus titanium alloys by powder metallurgy for biomedical applications

The aim of the project is to deal with the three main problems which cause fixation loosening in prosthesis and implants. These problems, with enormous social and economical interest, are: the stress shielding, which causes bone reabsorption with time, the increase in osteointegration, which needs for the development of surface treatments and the tribocorrosion problems observed in the implant junctions which provokes metalosis to the surrounding tissues. Tribocorrosion together with the stress shielding are the responsible for the aseptic loosening of the implant. It is then essential to consider all three aspects together because on one hand it is difficult to isolate them and on a second one it will generate only partial solutions to the whole problem.

Stress shielding will be solved through the development of low-modulus alloys, values closer to the modulus of the cortical bone which lies around 20 GPa. It is particularly important to control the diffusion of the alloying elements, especially of the metals with high melting point, and the final porosity, which will determine the final stiffness of the alloy.

Therefore it is possible to improve the osteointegration mechanisms by surface treatments increasing the lifetime of the prosthesis and implants. Among the different laser processing techniques, the laser cladding will be considered in this project. It allows completely modifying the surface of the titanium alloy with a different alloy or material with improved properties.

Applications

CV and letter of motivation