UNIVERSIDAD POLITÉCNICA DE MADRID

Expression of Interest – UPM Supervisor

Marie Skłodowska Curie Action –Postdoctoral Fellowship 2025 (MSCA-PF-2025)

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Department /Institute /Centre	**Name**	UPM Research Group on Laser Engineering and Applications Dept. of Applied Physics and Materials Engineering (ETSII-UPM)
	Address	C/ José Gutiérrez Abascal, 2. 28006 Madrid.
	Province	Madrid
Research Area		Information Science and Engineering (ENG) Physics (PHY) Chemistry (CHE)
Brief description of the Centre/Research Group		The UPM Research Group on Laser Engineering and Applications (UPM-GRIAL) is a homologated research unit with a wide experience in the conduction of R&D&I Projects in the field of laser processing applications. In particular, in the field of high-intensity laser matter interaction, application of advanced treatments and micromanufacturing applications, for which a deep process understanding has been gained through both numerical simulation and experimental characterization. The experimental site of the Group (UPM laser Centre) hosts important specific laser and robot facilities providing a convenient environment for pre- and post-PhD career development. Specifically, Laser Shock Processing, Laser Surface Micro-Nano Functionalization, Laser Additive Manufacturing, materials microstructural characterization and materials testing according to ASTM-ISO standards have been fields in which an important number of PhD students and postdocs have developed their research. Special mention deserves the participation of the team in several HORIZON2020, and MSCA projects. On the academic site, UPM-GRIAL is a leading institution at Spanish level for the formation on Laser Science, Engineering and Applications involving both theoretical and practical training with excellent connections to worldwide research institutes, experimental facilities and research programs on Materials Science and Engineering. The connection of CLUPM with key leading industrial companies provides a fruitful frame for the direct connection of PhD and postdoc candidates with the industrial applications world.

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Project description	A research line is proposed in the field of high-intensity laser treatment of high added-value metallic materials (i.e. high-grade stainless steels, titanium alloys, etc.) for the induction of subsurface residual stress fields as a post-processing method after their consolidation by laser-assisted directed energy deposition additive manufacture. The laser-assisted additive manufacture of metallic materials generates a far-from-equilibrium microstructure responsible for a poor mechanical performance. Traditional post-processing methods as HIP are normally used as normalizing treatments designed for the recovery of a stable microstructure granting an improved mechanical behaviour. However, this kind of treatments, while solving most of the problems associated to high porosity, may leave the consolidated components with a generalized soft microstructure frequently involving thermal-origin residual stresses fields. Laser Shock Processing has been developed as an advanced technique for the surface treatment of metallic components allowing the release of tensile residual stresses derived from manufacturing processes and as a method to impart compressive residual stresses fields in deep sub-surface layers with the result of drastically improving the mechanical performance of the treated workpieces, especially in what concerns their fatigue life. The purpose of the proposed research is the exploration of the suitability of Laser Shock Processing for the mechanical strengthening of laser-assisted additively manufactured components by introduction of compressive residual stresses fields and concurrent microstructural refinement. The first promising results in this line have been obtained, but a more extensive and systematic study referred to key strategic materials is needed.
Applications: documents to be submitted and deadlines	CV Letter of Motivation and Expectations 2 Letters of Reference Deadline: April 30th 2025