UNIVERSIDAD POLITÉCNICA DE MADRID

Expression of Interest-UPM Supervisor

Marie Skłodowska Curie Action–Postdoctoral Fellowship 2026 (MSCA-PF-2026)

Supervisor Name	Carmen Martínez Arévalo	
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Department /Institute / Centre Name/Location	Department of Engineering in Mechanical, Chemistry and Industrial Design at Higher Technical School of Engineering and Industrial Design.	
Research Area	Information Science and Engineering (ENG) G3-Products and Processes Engineering: Product design, process design and control, construction methods, civil engineering, energy processes, material engineering: - Energy collection, conversion and storage, renewable energy	Physics (PHY) P3-Condensed matter physics: - Fluid dynamics P5-Applied physics: - Computational modelling
Research team/group	The TE4S (Thermal Energy for Sustainability) research group has a solid foundation in the field of applied thermal engineering, encompassing areas as: thermal energy storage, energy system modelling, concentrated solar technologies, hydrogen production, and advanced power cycles. Its strength is evident in the achievements made in under 20 years, including + 50 patents, + 300 peer-reviewed publications and nearly 50 PhD theses. The group has obtained funding from Spanish and European calls and has established collaborations with research centres (MIT, IASS-Potsdam, Sandia Laboratories) and industrial partners. All these factors fosters an excellent environment for generating knowledge, creating and developing new ideas and proof of concepts. More information: https://short.upm.es/8a3zb	
Keywords	Sensible heat packed-bed system, thermal energy storage, heat transfer mechanisms, numerical modelling, energy-storage efficiency.	
Research Focus	**Exploring Coupled Thermal–Hydrodynamic Phenomena in Sensible-Heat Packed-Bed Energy Storage through Physics-Based Numerical Modelling** The objective of this project is to develop an advanced numerical framework to explore the coupled thermal–hydrodynamic processes governing sensible-heat packed-bed energy storage. In the context of the energy transition, packed-bed systems for sensible thermal energy storage have gained attention due to their simplicity, flexibility, high thermal capacity and low cost. The proposed methodology resolves the spatiotemporal evolution of temperature fields and flow dynamics under multiple charge–discharge cycles, enabling rigorous characterization of efficiency and system behavior. Particular emphasis will be placed on analysing thermocline stability, stratification degradation, and characterizing thermal-front propagation. The numerical model will be validated using a dedicated laboratory-scale packed-bed facility, supporting the derivation of design and operational criteria that enhance stability and long-term storage effectiveness.	

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Applications: documents to be submitted and deadlines	CV, letter of motivation, letter of references. Submissions to the supervisor by 24/04/2026.