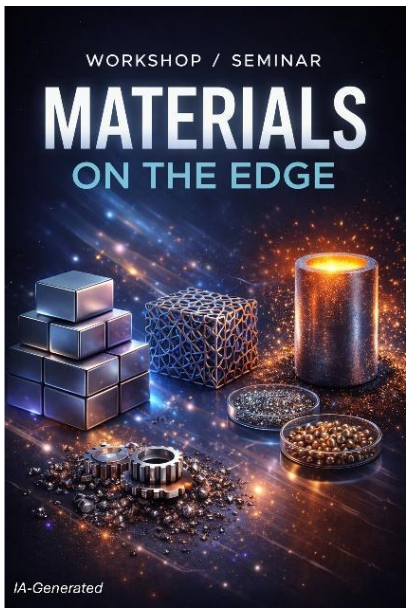

Materials on the edge

Frontier Research and Industrial Challenges

Tribute to Professor Jose Manuel Torralba

19th May 2026 *Venue: UC3M-Leganes*

The seminar “Materials on the Edge” is conceived as an academic event in tribute to Professor José Manuel Torralba, an internationally recognized leader in the field of Materials Science and Engineering, whose career has had a decisive impact on the development of advanced metallurgy, powder metallurgy, and the education of generations of researchers and engineers.

The event will bring together five internationally renowned speakers, leaders in different subfields of the discipline, who will address current scientific and technological challenges in structural and functional materials from a perspective that integrates physical fundamentals, microstructural design, advanced processing, and industrial applications.

The programme will combine plenary lectures, a scientific round-table discussion, and opportunities for informal interaction, fostering the exchange of ideas among established researchers, early-career scientists, PhD candidates, and professionals from the sector

Scope of the seminar

The main objective of the seminar is to analyse and discuss the most recent advances and emerging challenges in Materials Science and Engineering, with particular emphasis on:

- Microstructural design and control of advanced materials.
- Processing–microstructure–property relationships.
- The role of modelling, advanced characterization techniques, and sustainable metallurgy.
- Knowledge transfer from fundamental research to high value-added industrial applications.

In addition, the seminar aims to acknowledge the scientific, academic, and personal contributions of Professor José Manuel Torralba, highlighting his role as a driving force behind integrative approaches that bridge basic science, process engineering, and industrial application.

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Scientific PROGRAMME

8:30-9:00 Registration & Inf. Desk

9:00: Open ceremony. Opening remarks and welcome to attendees from the Head of School of Engineering, Prof. César Huete and Prof. Mónica Campos (chair of the workshop)

9:30 Prof. Jon Molina 4D printed smart nitinol based medical devices *Additive manufacturing (AM) technologies have reinvented many areas of product development. In the medical field, the ability to promote patient personalization has become a key factor. AM technologies allow the manufacturing, based on medical images, of models for surgical planning, surgical guides and even, implants and porous scaffolds for tissue regeneration. However, many of these applications are static and do not allow a dynamic interaction, which would enable minimally invasive surgeries. or allow shape changes according to the healing process of the tissue. The use of "smart" medical devices, obtained through the emerging concept of "4D printing", capable of undergoing progressive metamorphosis according to surgical procedures, biological integration and/or healing processes, is still a dream, especially in metallic materials that offer substantial load bearing capabilities. The AM of smart metallic alloys, like nitinol, might offer solutions in this area.*

10:15 Prof. Alberto Molinari. Physical Metallurgy in Additive Manufacturing: the case of maraging steel. *This talk will address the physical metallurgy of maraging steels processed by L-PBF, with emphasis on the unique thermal cycles and rapid solidification inherent to the process. It will highlight challenges such as microsegregation, retained/reverted austenite, and precipitation control during intrinsic and post-build aging. The interplay between process parameters, phase transformations, and defect population. Maraging steels will be used as a model system to illustrate key metallurgical issues in AM*

11:00 Coffee break

11:30 Prof. Lars Nyborg. **From Sintering to HIP: Advanced Pathways to Full Density PM**. Achieving full density in powder metallurgy can be approached through different advanced consolidation strategies. This talk will focus on sintering to closed porosity followed by hot isostatic pressing (HIP) as an effective route to eliminate residual porosity, as well as on nanotechnology-enhanced sintering based on carefully tuned powder mixtures that promote densification. In addition, alternative powder forming methods beyond the classical press-and-sinter route will be discussed, highlighting how these approaches can be used to tailor powder characteristics and green compacts in order to optimize subsequent sintering and consolidation steps

12:15 Round table "**From Metallurgical Innovation to Industrial Reality: Challenges and Opportunities in Powder-Based Materials**" (moderated by Cesar Molins -CEO of AMES- and Manel Perez-Latre -Secretary of CEP–EPMA-)

13:00 Lunch

14.30 Prof. Iñigo Iturriza. **"Ni Superalloys in Jet Engines: A Journey Through Remarkable Microstructures"** *The history of Ni-based superalloys in jet engines is a story of continuous innovation driven by ever more demanding operating conditions. From the first wrought and cast alloys used in early turbines, the need for higher temperature capability, creep resistance, and reliability led to major advances in alloy design and processing, including precipitation strengthening, control of grain boundaries, and increasingly complex chemistries. Among these developments, powder metallurgy routes -particularly the hot isostatic pressing (HIP) of encapsulated Ni superalloy powders- have played a key role by enabling fine and homogeneous microstructures, reduced segregation, and the manufacture of highly alloyed compositions. In parallel, the quest for maximum performance pushed the evolution from equiaxed and directionally solidified alloys to single-crystal superalloys, whose remarkable microstructures eliminate grain-boundary limitations and remain one of the most fascinating achievements in materials science for aviation turbines."*

15.15 Prof. Danninger "When Oxygen Matters: Surface Chemistry and Early-Stage Sintering" *The sintering behaviour of powder-based metallic systems is strongly influenced by surface chemistry, with oxygen playing a particularly critical role. This contribution examines how surface oxides affect diffusion mechanisms, neck formation, and densification during the early stages of sintering. Key chemical reactions occurring at particle surfaces are discussed, highlighting how subtle differences in oxygen content and oxide stability can lead to markedly different sintering responses across metallic systems. Understanding and controlling these effects is essential for optimizing sintering routes and achieving reliable and reproducible densification.*

16:00 Closing remarks: Prof. Mónica Campos

16:45 End of the workshop

Attendance is free, but registration is mandatory.
Early-career scientists and PhD students are encouraged to register.
English will be the official language of the workshop.

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