NetCastPL4.0 Seminars Series

Online event, **February 26 (Thursday)**, 2026, 10:00-11:30 am CET

02:00 pm – Dario Ripamonti (20-25 minutes)	02:30 pm – Riccardo Donnini (20-25 minutes)
Creep deformation and microstructural evolution in Ni-base superalloys Creep is the deformation mechanism that takes place when a material is mechanically loaded at temperatures high enough to allow for solid state diffusion. The ability to withstand such loads over time (creep strength) is often a life-limiting factor for materials serviced at high temperatures. This seminar will provide a brief overview of the phenomenological aspects of creep, together with the description of the creep curve, and of the fundamentals of creep mechanisms. Creep deformation can threaten the long-term structural integrity of components operating at high temperatures, so in harsh conditions nickel base superalloys are often a suitable solution since they offer a unique combination of high creep strength and excellent hot corrosion resistance. Their creep behavior, though, is usually much more complex than the one observed in more conventional materials such as high alloyed steels. The talk will emphasize some aspects of the creep behavior of Ni base single crystal alloys, whose deformation is often associated to a peculiar microstructural evolution called rafting.	**High temperature performance of alloys: the behavior of Ni-based superalloys under dynamic loadings of mechanical and thermomechanical fatigue** The opportunities and challenges for increasing efficiency in modern turbines, both in power generation and aeronautics, depend significantly on the development of high-performance alloys and also their behavior under dynamic loading. Indeed, the integration of diverse energy sources as well as the high level performance demands of modern engines, can induce complex mechanical and thermomechanical cycles. Consequently, an in-depth analysis of these damage mechanisms is crucial to ensuring long-term structural integrity under fatigue loadings. Nickel-based superalloys remain a very important material of these industries due to their exceptional microstructural stability at temperatures often exceeding 0.7 Tm (melting point). However, the work conditions for the interested components can be characterized by the aforesaid cyclic loading conditions that lead complex degradation mechanisms. The webinar aims to explore approaches and examples on the behavior of nickel-based superalloys under mechanical fatigue at constant high temperature (low cycle fatigue) and thermo-mechanical fatigue, highlighting features and issues on both polycrystalline and single-crystal configuration of the microstructures as well as their respective roles in the applications under consideration.

Dario Ripamonti, Ph.D.

Researcher at CNR-ICMATE in Milano, Italy since 2011. His expertise lies in the field of mechanical and physical metallurgy, with a strong focus on the mechanical behavior of advanced structural alloys for high temperature applications, in particular for power generation (Ni-base superalloys, high alloyed steels).

His research activities primarily involve high temperature mechanical testing, such as creep and stress relaxation, and microstructural analysis through electron microscopy.

Riccardo Donnini, Ph.D.

Researcher at CNR-ICMATE (Milan unit). His work focuses on damage and deformation mechanisms in metallic materials and associated chemical-physics phenomena, especially for high-temperature and manufacturing applications (e.g., nickel-based superalloys, stainless steels, cast irons). His research involves studying material behavior under high-temperature stress (e.g., fatigue LCF and TMF) and performing microstructural analysis via microscopy and X-ray diffraction. Drawing on his expertise in X-ray diffraction, he has also expanded his collaborations to non-metallic materials.

Join the event