



MINISYMPOSIUM

STRUCTURAL INTEGRITY AND FATIGUE ASSESSMENT OF ADDITIVE MANUFACTURED METALS AND BIOMATERIALS

1. Thematic session title

Structural integrity And Fatigue assessment of ADDitive manufactured metals and BIOmaterials (SAFE-BIOADD)

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4. Short description of the symposium including the scope and target public

Manufacturing processes are experiencing a revolution led by Additive Manufacturing. Near net shape production capabilities, associated with high design freedom makes Additive Manufacturing attractive for many industrial sectors, which is the case of the aeronautical/aerospace, transports, energy, tooling, biomedical, among other industrial sectors. Nevertheless, the need to produce reliable functional parts thrives the research on additive manufacturing processes and particularly the studies on fatigue and fracture behaviour of additively produced materials and components become mandatory. Specificities of the Additive Manufacturing such as the characteristic heterogeneous microstructures, the presence of porous inherent to the process, residual stresses, poor surface finishes, the multitude of processing parameters (e.g. build direction, scanning strategy) among other particular features, requires to revisit the topics of fatigue and fracture testing, modelling and simulation. The present symposium (F-ICMFM2020-SAFE-ADD) intends to gather researchers in a scientific/technical discussion aimed at establishing the current understanding of the structural integrity, including the fatigue and fracture behaviours of AM materials and mechanical and structural components, and

identifying future trends. The participants of this thematic symposium will also benefit from interactions with ICMFM2020, which is a well-established and focused colloquium on metal fatigue. This Symposium is intended to be a forum of discussion of the recent advances in the domain of fatigue strength and fracture mechanics of biomaterials and implants. It is also expected that issues regarding the design of implants in accordance with the principles of biomechanical adjustment to the properties of tissue structures. Contributions are expected from biomedical engineers, scientists, consultants as well as from experts in the field of experimental mechanics and fatigue researchers. We also would like to promote research and the discussion of biomechanical issues related to bone and implant fracture and its fixation. We expect that specialists from the field of medicine, biomechanics, bioengineering and related sciences will also want to present achievements in analytical, as well as experimental works from the wide spectrum of fatigue mechanics.

Contributions are welcome on the following topics, among others:

- Fatigue behaviour of AM metals (LCF to VHCF, Multiaxial, Damage accumulation, Crack Initiation and propagation, Probabilistic and Reliability methods, etc.);
- Integrity and reliability assessment of additive manufactured components;
- Fracture behaviour of AM metals and parts;
- Effects of processing parameters on fatigue and fracture performances;
- New testing procedures: fatigue standardization and qualification.
- Computational prediction of the fatigue behaviour of metallic biomaterials
- Structural Integrity Assessment and fatigue analysis of the biomedical devices and metallic structures commonly used in bioengineering
- Experimental methods and lifetime modelling using local and non-local approaches
- Multiscale modelling of the fatigue crack growth rate in bio-materials (including metals and its composites)
- Fatigue properties of the materials for implants and biomedical application,
- Environmental aspects of biomaterials fatigue properties
- Analyses of bones and implants fatigue and fracture
- Mechanics of impact and trauma, mechanics of fracture and implant fixation
- Durability tests of coatings on metallic implants

Testing of metallic scaffolds for tissue engineering

Selected papers of the F-ICMFM2020-SAFE-BIOADD will be encouraged to be submitted to journals associated to the ICMFM2020 including ACTA OF BIOENGINEERING AND BIOMECHANICS. The F-ICMFM2020-SAFE-BIOADD symposium is envisaged as an ESIS activity promoted by the ESIS-TC15 on Structural Integrity of Additive Manufactured Components.

Please submit your work by email to **ajesus@fe.up.pt**
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icmfmx@pwr.edu.pl with subject F-ICMFM2020-SAFE-ADD.