EUROMAT 2019 / Area C: Processing

SYMPOSIUM: C2

Title: Laser materials processing and manufacturing

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Abstract

Recent developments in lasers, optics and robotics are opening new perspectives for improved laser–assisted materials processing and manufacturing methods, allowing for faster and more effective fabrication methods and widening the range of laser materials processing applications in areas such as micromachining, additive manufacturing, surface modification, coating production, thin films deposition, nanoparticles production, cutting, drilling, and welding.

This symposium addresses the latest scientific and technological breakthroughs in laser materials processing and manufacturing, made possible by those developments. This involves both advances in traditional fabrication methods (welding, cutting, drilling, surface hardening, etc.) but mainly and in new applications, made possible by the recent availability and increasingly lower cost of ultrafast lasers and laser-based additive manufacturing methods. Ultrafast lasers, with pulse duration in the picosecond to femtosecond ranges, and radiation intensities sufficient to promote non-linear ionization have enabled developing new manufacturing and surface modification processes with unprecedented accuracy and minimal degradation of the material. Laser-based additive manufacturing methods enable the fabrication of components in a wide range of materials by melting or sintering polymeric, ceramic or metallic powders, locally polymerizing a monomer in liquid phase or by melting material supplied in wire or powder form to the laser-material interaction zone to create a solid by rapid solidification.

Hot topics include, but are not limited to:

C2.1: Additive manufacturing

- Recent developments in laser additive manufacturing.
- New materials for laser-based additive manufacturing.
- Material science aspects in additive manufacturing.
- Powder bed consolidation mechanisms and microstructure formation.
- Manufacturing of multi-material components.
- Modeling of laser-based additive manufacturing.
- Hybrid approaches to overcome limitations in additive manufacturing.

- Advanced 3D manufacturing: micro and nano scale patterning.
- Applications and business scenarios for advanced materials in Additive Manufacturing.

C2.2: Laser-assisted surface engineering

- Laser hardening: principles, methods and applications.
- Laser surface texturing.
- Laser patterning.
- Laser melting and alloying.
- Laser cladding: principles, methods and applications.
- Materials science aspects of laser surface treatment.
- Microstructure formation and materials properties control in laser melting, alloying and cladding.
- Laser cladding as a materials synthesis method.
- Functionally graded layers.
- Modeling.

C2.3: Ultrafast laser materials processing

- Physical aspects of ultrafast laser-material interaction
- Modeling of ultrafast laser materials processing
- Current trends in laser micromachining
- Innovative laser micromachining applications
- Laser applications in microfluidics
- Laser-based nanoparticles production methods
- New surface and bulk marking methods based on ultrafast lasers
- Application of ultrafast lasers in jewelry
- Laser applications in photovoltaics
- Materials science aspects of ultrafast laser processing

C2.4: Innovative laser applications in conventional manufacturing

- New developments in laser welding
- Novel glass welding/dicing applications based on ultrafast lasers

C2.5: Cutting-edge methods