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MULTISCALE MODELLING OF MATERIALS AND STRUCTURES

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ABSTRACT

Numerical modelling of behaviour of materials and structures under conditions of processing, manufacturing and exploitation is widely used in industry and research. Several classical and alternative methods are commonly used to create a complex description of a particular deformation, thermomechanical or heat treatment processes and computational models replicate phenomena, that take place in the material in different length and time scales. The objective of the minisymposium is to gather researchers working on various aspects of modelling of phenomena occurring in materials at various scales, from nano through micro and mezo to macro scale, and to enable exchange of experience.
The papers on the following topics are invited:

- Conventional multi scale approaches based on the FE (XFEM, GFEM, FE2).
- Theoretical basis of various applications of multi-scale analysis techniques, such as Homogenization Method (HM), Monte Carlo (MC) method, Cellular Automata (CA) method, Molecular Dynamics (MD), etc.
- Alternative multi scale methods: e.g. combination of the CA-FE method, Neuro-Fuzzy Cellular Automata–Finite Element technique (nF-CAFE) or Neuro Expert Cellular Automata–Finite Element models (NESCAFE).
- Development of the statistically representative volume elements.
- Multiscale methods involving uncertainties.
- Multi scale approaches based on the mesh free methods and other particle methods.
- Adaptive *hp* methods in multiscale modelling.
- Applications of the multi scale modelling to existing and future industrial problems such as melting, casting, welding, laser treatment, joining, forming, semi-solid metalworking, highly filled material processing, injection moulding, blow or compression moulding, vapour deposition, molecular beam epitaxy, and others.
- Solving microstructural problems, such as crack propagation, strain localization, microstructure evolution, solidification, phase transformation and others.
- Application of the mutliscale modelling to functionally grader and sandwich materials, etc.
- New multiscale computational optimization approaches in design of engineering materials.
- Inverse problems in multiscale modelling.