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MULTI-SCALE AND MULTI-PHYSICS PHENOMENA IN POLYMERS -- EXPERIMENTAL AND COMPUATIONAL ASPECTS --

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ABSTRACT

The understanding of complex physical behaviour of natural and synthetic polymers stemming from chemical composition, microstructure and manufacturing process is an active field of research. Conventional experimental measurements are inadequate as they merely provide macroscopic relations between stress and deformation. Spectacular developments in experimental and visualisation techniques enable direct access to real time micro-structural changes in polymeric materials, which have the potential to enhance our knowledge in polymer physics considerably. New visualisation and experimental techniques allow physics-based modelling at micro-scale and proper development of efficient homogenization techniques across the scales promoting more accurate and complete description of this class of materials. Within this context, theoretical and computational modelling of hyperelasticity, viscoelasticity, thermo-visco-elasticity, damage, strain induced crystallization based on new experimental findings and emerging computational techniques is of great interest. Moreover, experimental, theoretical and computational treatment of fatigue, durability, and quasi-static and dynamic fracture of polymeric materials is a challenging endeavour and closely related to the material microstructure. The aim of this mini-symposium is to advance our understanding of polymeric materials by gathering researchers from *material science*, *experimental mechanics* and *computational mechanics* and stimulate interaction and discussions across three disciplines.

This mini-symposium focuses on, but is not necessarily restricted to the following areas:

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- Multi-scale analysis and homogenization methods in multi-physics problems in rubbery and glassy polymers.
- Novel experimental techniques in polymer mechanics; particularly in strain-induced crystallization, microstructural characterization, characterization of coupling terms in multi-physics problems.
- Parameter identification procedures based on full-field measurement techniques.
- Multi-physics phenomena such as thermo-, chemo- magneto- mechanics, and diffusion-mechanics coupling.
- Computational treatment of multi-physics problems associated with polymers in the context of the finite element method, smooth particle hydrodynamics and XFEM.
- Constitutive models for hyperelasticity and inelasticity in polymeric materials.

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