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MATERIAL MODELING WITH MULTISCALING

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ABSTRACT

This minisymposim focuses on the theories and applications of material modelling within the framework of multiscale computational methods. Not only the developments of constitutive models for specific materials by means of multiscaling schemes, but also the applications of standard and advanced models to numerical analyses with multiscaling can be within the scope of discussions. Of course, a class of computational homogenization methods must be one of the promising strategies for determining the effective behaviour of complex and highly heterogeneous materials, and for computing the response of structures composed of these materials. But, the introduction of other methods and/or their combinations must be of great utility value to all pending challenges in reproducing complex material behaviour.

The topics covered include (but not limited to) :

- Heterogeneous, time-dependent and nonlinear material behaviour, including material dynamics;
- Heterogeneous materials with coupled multi-physics behaviour (phase change, chemo-mechanics, nonlinear thermo-mechanics...), including extended homogenization schemes;
- Materials with a complex physical geometry, e.g. provided by high resolution 3D imaging techniques;
- Multiscale damage modelling, capturing the transition from homogenization to localization;
- Computational homogenization including surface, size and second-order effects;
- Microstructures with complex interfaces;
- Multiscale simulations with non-local phenomena like cracks, instabilities or shear bands;
- Reduction of computational costs associated with multiscale algorithms;
- Integration of phenomena occurring at nanoscale.