

MSE 2024

24 - 26 Sep 2024 (Darmstadt)

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Topic C: Characterization

C05: In-situ mechanical testing and numerical modeling of small-scale mechanical behaviour - a COST MecaNano Symposium

Mechanical behavior at the micron and nanoscale is gaining increasing importance in a wide variety of different materials due to the miniaturization of components and systems as well as the introduction of hierarchical multi-scale material designs. Therefore, a rapid development of innovative in-situ and small-scale testing techniques is necessary, which allows further insights in the acting deformation processes and fundamental deformation and failure mechanisms. At the same time, these small length-scales provide the chance for a direct handshake of experimental investigations and computer simulations. Promoting this link will speed up the necessary development of material physics based, predictive models of small-scale mechanical behaviour.

This symposium, which will be organized together with working groups 1 and 2 of the European Network for the Mechanics of Matter at the Nano-Scale (MecaNano Cost Action21121, <https://mecanano-gm23.sciencesconf.org>), will mainly focus on both, the development, challenges, and application of new advanced mechanical in-situ testing techniques as well as simulation methods to foster a better understanding of the local mechanical behavior of different materials and microstructural constituents. Besides possible size effects in the deformation behavior in that scaling regime, combined experimental, simulation, and machine learning approaches are also of special interest and should be discussed.

Topics of interest include, but are not limited to:

- Advanced small scale testing techniques (e.g. Nanoindentation, μ -compression, μ -tension testing, μ -bending)
- Testing at elevated and cryogenic temperatures, under various atmospheres, such as hydrogen, in different fields, e.g. electro-magnetic fields as well as in different environmental conditions, e.g. corrosive environments or inert environments for e.g. battery materials
- Simulation and modelling approaches to complement small scale mechanical testing, from the atomistic to the microstructural level; multiscale and multiphysics simulations
- Investigating and understanding and size effects in the deformation behavior, including interface mediated deformation behavior and the coupling environment and deformation
- New testing approaches, analysis concepts, and corresponding challenges in the micro and nano scale mechanical testing, innovative evaluation of localized phenomena by use of digital image correlation, acoustic and thermal measurements or combined full-field measurements
- Correlation with high resolution microscopy analysis as well as in-situ and operando testing using optical microscopy, SEM, TEM, APT, AFM, Raman, or X-ray
- Machine-learning and data-science based approaches

Symposium Organizer



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