

FEMS EUROMAT23

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FEMS EUROMAT is the most important international congress in materials science and technology in Europe. It continues a successful congress series promoting the transfer of knowledge and the exchange of experience between academia and industry. **Submission deadline: 31 January 2023**

Area D: Characterization and Modeling

D10: Multiscale and Multiphysics Modeling of Materials

Multiscale and multiphysics modeling of materials, processes, and products play an essential role in science and industry. Models at electronic and atomic scales provide insights into the physical and chemical foundations, thermodynamics, structures, defect energies, and mechanisms that stand behind the properties of many materials, thus serving as a starting point and basis for advanced materials design. Yet, materials are mostly not used in their thermodynamic equilibrium but used in 'frozen' transient states. This means that their complex microstructure cosmos plays a dominant role for structure-composition-property predictions. This advocates the use of a wide range of thermodynamically and atomistically informed discrete and mean-field microstructure models, including dislocation-, interface- and phase-transformation-models, usually in junction with finite element, finite difference, spectral, or artificial intelligence (AI) solvers. Typical examples are discrete dislocation dynamics, phase field, and crystal plasticity models. The successful implementation of scale- and mechanism-bridging models hinges on the formulation and dissemination of robust simulation frameworks that allow combining atomistic, meso-scale, and mean-field continuum approaches, as well as employing data-driven approaches. Latter methods from AI, as an emerging additional approach in this field, depend on the availability of data and their accessibility according to the FAIR standard (Findability, Accessibility, Interoperability, and Reuse of digital assets).

The main objective of this symposium is to explore and discuss the latest developments in these fields. Focus is placed on models and AI methods for the design of advanced materials, microstructures, and properties using the latest state-of-the-art multiscale and multiphysics modeling techniques, considering structural, mechanical, and functional material properties. A critical reflection of the predictive capability of these multiscale and multiphysics models is of particular relevance. Also of significance is hybrid modeling in the sense of a combination of physical-based and AI driven models covering multiscale or multiphysics problems.

Within this symposium, we invite contributions on the application of multiscale or multiphysics modeling, including at least two scale levels or physical phenomena. Symposium contributions on the implementation of AI-based methods to resolve multiscale or multiphysics problems related to material modeling are also welcome. Also, symposium contributions focused on synergy between multiscale or multiphysics modeling and experiments are invited.

The symposium is open to all material classes (e.g., structural, functional, energy materials, etc.) and diverse fields of application (sustainable and renewable energy, mechanical engineering, metallurgy, etc.).

[The symposium is cooperating with symposium C10.](#)

Symposium Organizer



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