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MULTI-SCALE AND MACHINE LEARNING-BASED MODELING METHODS FOR OPTIMIZATION AND DESIGN OF COMPOSITES

Chao Zhang[1], Alfonso Pagani[2], Marco Petrolo[2] and Gunjin Yun[3]*

[1]Northwestern Polytechnical University
[2]Politecnico di Torino
[3]Seoul National University

MINISYMPOSIUM

Composite materials continue to attract interest from advanced Industries, mainly because of their advantageous mechanical characteristics. Nevertheless, many problems related to *optimization, design, and verification* of composite structures remain unsolved, primarily because of the lack of appropriate methodologies and analysis tools.

Nowadays, multi-scale simulation is a popular method for analyzing and predicting, for example, the failure mechanisms and, eventually, for taking into account the intricate architecture of composite materials at their different scales. Multi-physics problem in advanced and smart composites in addition to the composites applications in extreme environments are adding to the complicacy of the computational modelings. Sensitivity analysis and uncertainty quantifications integrated with multi-physics and multi-scale simulations needs to be used to obtain more reliable designs. Albeit multi-scale simulations may soon become computationally prohibitive, and the problem domain is, in general, limited to small portions of the structure or representative units, breakthrough researches are emerging in this domain.

The mini-symposium “Multi-scale and machine learning-based modeling methods for optimization and design of composites” aims at outlining the state-of-the-art and the perspectives of the research in the field of simulations of advanced composites materials and structures. Scientists are invited to share new research ideas and results about all aspects of the modeling and design of composites. Topics of interest include but are not limited to micro-mechanics, meso- and multi-scale analysis, beam, plate, and shell models, sensitivity analysis, robust design and optimization, crack initiation and propagation, impact analysis, aging, multi-field, and multi-physics problems. Attention will also be given to the use of (physics-based) machine-learning algorithms for more accurate predictions of damage and mechanical responses, solving inverse problems, optimization, defect quantification and characterization, and best theory selection.