VI International Conference on Simulation for Additive Manufacturing, SIM-AM 2027
September 13-16, 2027, Weimar, Germany

MULTIPHYSICS SIMULATION OF ADDITIVELY MANUFACTURED LATTICES: MECHANICAL, THERMAL AND ACOUSTIC PERFORMANCE

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ABSTRACT

Additively manufactured lattice structures offer a versatile route to tailor mechanical, thermal, and acoustic performance through the combined choice of material, architecture, and manufacturing strategy. Predicting their behaviour, however, remains challenging: local geometry, material distribution, process-induced imperfections, and boundary conditions interact across multiple length scales. These challenges become relevant for multimaterial architectures, in which complementary phases and their interfaces can influence the overall response.

This invited session aims to bring together researchers developing and applying numerical methods for the design and analysis of additively manufactured lattices. Contributions may address mechanical behaviour under static, cyclic, or dynamic loading; heat transfer and thermal management; vibration, sound absorption, and acoustic transmission; as well as coupled phenomena linking these responses. Relevant approaches include detailed geometric models, homogenization and multiscale methods, reduced-order and data-driven models, and multiphysics simulation. Studies on topology optimization, inverse design, and the design of graded or multimaterial architectures are also encouraged.

Particular attention will be given to the connection between idealized numerical models and manufactured components. Topics of interest include the representation of printing paths, anisotropy, porosity, geometric deviations, interfaces, and process-dependent material properties, together with their effects on predictive accuracy. Experimental characterization, model calibration, verification, validation, and uncertainty assessment are welcome when they help establish the reliability and transferability of simulation results.

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