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Additive Manufacturing of open porous structures: correlation of laboratory testing to simulations for application related properties

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Additive manufacturing (AM) is well known for its high customizability and freedom of form but can also be utilized to produce open porous structures. Those structures are widely known for being advantageous to mixing and heat transfer applications, as they combine high surface areas with a stochastic cross-linked network of channels. Thus, good mixing of flowing through media is achieved as well.

This study investigates the possibilities especially enabled by laser-based powder bed fusion (PBF-LB) to create and design porous structures with pre-defined properties. The current state of the art of manufacturing functional structures will be explained, while perusing recent complements. Consequently, a novel manufacturing-parameter-based way of designing functional structures will be utilized. Various open porous samples will be created, showing the comprehensive range of achievable variations. Samples will be evaluated for application-related properties in laboratory tests, whereby direction-dependency will be considered as well.

To improve future application and to finally come to the situation of creating materials with pre-defined properties a Digital Twin of the material will be created. As a first step to realize this vision, the results of laboratory testing will be correlated to simulations. 3D-imaging will be applied to generate a digital twin of selected open porosities. Predictive simulation models can be built based on the first mathematical, testing and digital analyses of porous samples. By means of simulation models, the thermodynamic and fluid mechanical properties of porosities are further investigated for practical applications.

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Time Block Preference

Time Block B (14:00-17:00 CET)

Participation

In person

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