

Modeling for particle filled 3D printing

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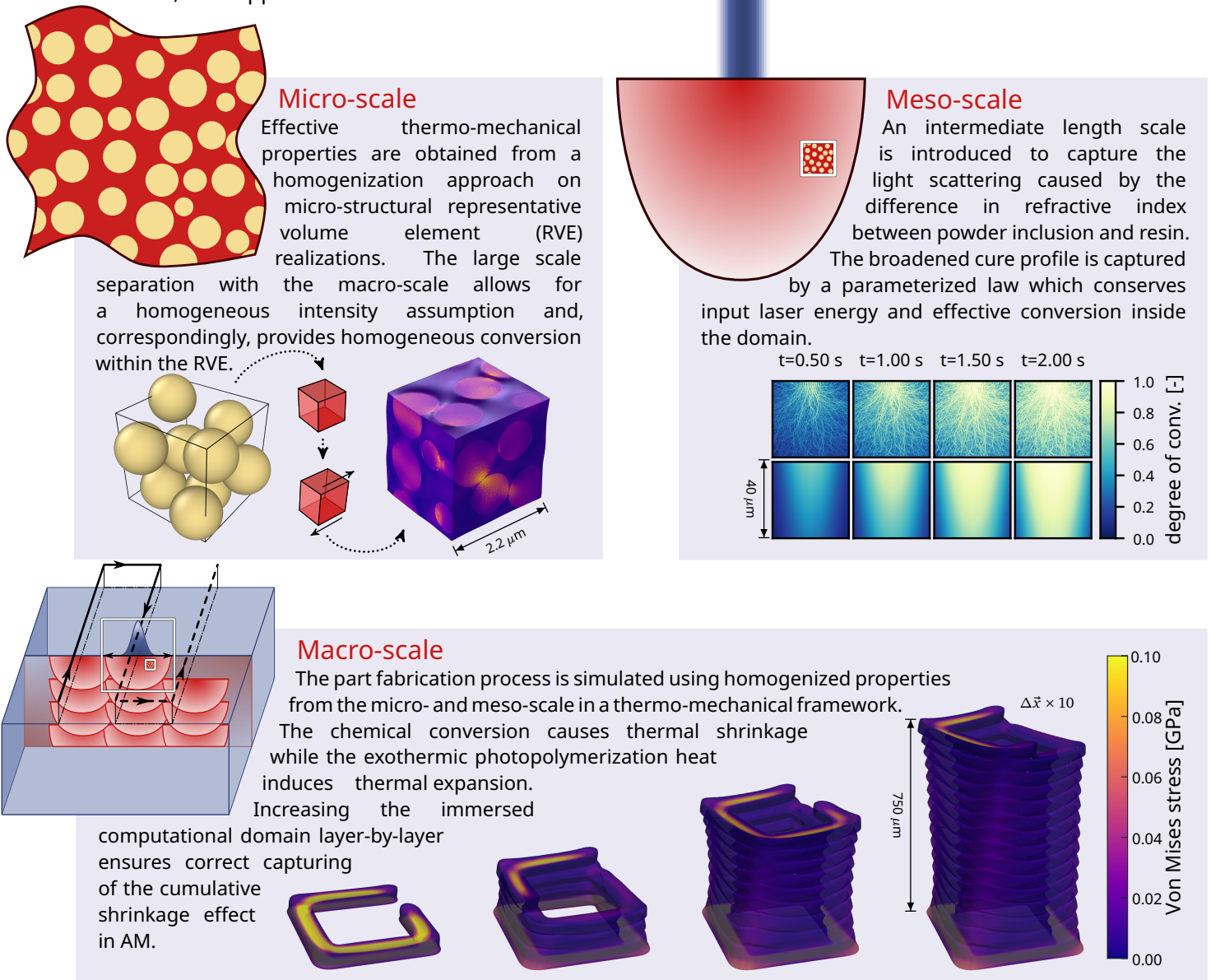
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Modeling for particle filled 3D printing

Predicting residual stress and deformation through a multi-physical and multi-scale numerical framework

Steyn Westbeek, Joris Remmers, Hans van Dommelen, Marc Geers

Vat photopolymerization or stereolithography is a versatile Additive Manufacturing (AM) technique broadly used for functional high quality polymer products. This technique can be used to produce composites or ceramic parts, by adding ceramic particles to the polymer. As the inclusion of the powder filler results in a more complex irradiation and thermo-mechanical behavior of the material, multi-physical and multi-scale numerical models are generated to further the understanding of the print process. From small to large, these length scales are referred to as the micro-, meso- and macro-scale, with application to an alumina filler.



Using the developed multi-scale framework, the multi-physical nature of the filled vat photopolymerization process can be studied. The combination of the different length scales provides insight in the influence of the particulate inclusions on the required material and process conditions. In the end, this will further assist to obtain the intended final product first-time-right.