Contribution ID: **9** Type: **2. Invited speaker (by invitation only)**

Sintering Models Assessment from Experimental Tests to Inverse Learning Approaches: The Role of Sintering Moduli in Rapid Sintering and 3D-Printed Structures

Assessing sintering models experimentally is challenging, as it requires isolating both the thermally activated nature of sintering and the powder-specific behavior encoded in the sintering moduli. These parameters often exhibit strong interconnections, necessitating dedicated experiments such as instrumented sinter-forging tests. In parallel, inverse learning strategies based on gradient-descent optimization enable direct identification of model parameters and their interdependencies from dilatometry curves, using a framework inspired by machine learning. The resulting experimentally derived moduli accurately reflect the true behavior of the powder. We show that these experimental moduli are highly effective in reproducing ultra-rapid sintering kinetics, whereas theoretical models (based on simplified geometric assumptions) systematically underestimate the densification rate. Moreover, analyzing the final stage of densification provides reliable predictions of grain-growth behavior in particular for materials exhibiting strong grain-growth perturbations such as zirconia.
An additional perspective involves using representative volume elements (RVE) to determine effective sintering moduli for complex lattice architectures produced by 3D printing. Coupling finely extracted experimental parameters with machine learning tools enables robust finite element simulations capable of predicting the sintering of both bulk materials and architectured structures.

Professional Status of the Speaker

Senior Scientist

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

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