Simulations of inkjet and sintering processes in high speed sintering

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ABSTRACT

High speed sintering (HSS) is a brand-new powder bed fusion additive manufacturing technology based on thermoplastic polymer [1]. Compared with other powder bed fusion technologies, due to the “face → body” building process, the process speed of the HSS fundamentally rises. In HSS, radiation absorbing material (RAM) is jetted onto the top layer of powders to increase their infrared absorption, and then the infrared light will melt powders. After the infrared heating, the melted powders crystallize and integrate to predefined 3D geometries.

In this study, research consists of two simulations based on polyamide 12 (PA12) powder: RAM inkjet and infrared heating sintering processes. A computed-fluid-dynamic (CFD) volume of fraction (VoF) model is chosen to modelling the RAM inkjet and ink diffusion in powder layer to determine the RAM ink demand. The inkjet dynamics is driven by the combined action of gravity, surface tension and contact angle. The sintering process is modelled to evaluate and predict the temperature distribution and depths of the melt pools with different infrared light power and heating time. The model takes into account the interaction between the infrared light and powder bed with or without RAM, the temperature-dependent material properties and the solid-liquid phase transition.

REFERENCES