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Towards an understanding of digitally printed materials

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The build materials in most 3D printing processes fall into three categories: solid filaments, solid particles as powders or in suspensions, or liquids that can be solidified. From these materials, parts are constructed to meet the performance requirements defined by the product use. The part performance depends not only on the build material compositions and property, the designed geometry of the part, but also on the microstructure within the part. In 3D printing, besides microstructures in the build materials, the print process and path of material delivery also drive the formation of additional microstructures. The microstructure within the printed part can take on three forms. The first depends on the characteristics of the material which make up the smallest build unit (a voxel), such as a powder volume created by a drop of glue from the binder jetting printing. The second comes from the path that generates the progressive, layer-by-layer assembly of voxels. The last form is the intentionally designed tunable structures. The ability of placing a different material in each physical voxel will allow the construction of a part that may have a "continuum" of properties that range between the constituent materials. This presentation will discuss the different material microstructures resulted from 3D print processes and the methods we have developed to study these microstructures.

Biography

Shu Chang holds the Melbert B Cary Jr. Distinguished Professorship in the College of Imaging Arts and Sciences at the Rochester Institute of Technology (RIT), USA. Her research applies techniques from digital printing to the rapidly growing field of print for fabrication. She has focused on quantifying the material properties and the additive manufacturing process capabilities. Prior to RIT, she was in the print industry for more than two decades. She holds 27 US patents as well as 54 professional publications. She received her PhD in Materials Science and Engineering from the University of Minnesota, USA. She is interested in 3D printing materials, 3d printing resolution, 3d printing quality control and prediction.

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