

3D Printing Materials Sciences

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Abstract

The progress of materials science and technology is often propelled by the development and breakthrough of synthetic techniques. The recently emerged 3D printing technologies (or additive manufacturing (AM)) utilize computer-aided design files to produce materials and parts that have potential applications in multiple fields. Compared to conventional manufacturing techniques, AM has advantages of time- and cost-saving, minimum waste, and large design freedom for complex geometry components. Although AM focuses more frequently on an engineering scheme, it offers unique opportunities to tailor materials properties with highly nonequilibrium microstructures and/or through ingenious structural designs, leading to extraordinary materials properties that can extend far beyond those achievable via conventional processing methods. This helps to open a new field of 3D printing materials science. In this presentation we will show a few interesting examples of common engineering materials that can be manufactured by 3D printing technologies, including metals and alloys, ceramics, carbon, and lattice structures derived from these baseline materials. While we are excited about the unique properties that can be achieved in these materials, some serious deficiencies exist in 3D printing technologies. We will discuss immediate scientific challenges and potential solutions.

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Brief bio of the speaker

Dr. Y. Morris Wang obtained his PhD in materials science and two master's degrees, all from the Johns Hopkins University. He is a Deputy Group Leader for the Nanoscale Integration Science Group of the Materials Science Division at Lawrence Livermore National Laboratory. Dr. Wang is a Fellow of American Physical Society and a winner of Nano50 Innovator Award. He has published over 120 articles in highly reputable journals and has been serving as an Editorial Board Member of Scientific Report (Nature) since January 2017.