Abstract

Unlocking Innovation in Materials and Manufacturing via Open-Source AM

Additive manufacturing (AM) systems have historically operated as closed, proprietary platforms, limiting user control over essential process parameters and slowing advancements in material innovation. The Open AM initiative at DTU addresses these limitations through an open architecture model that empowers researchers to modify system parameters, integrate custom sensors, and rapidly iterate designs. This open framework has accelerated materials discovery and fosters a collaborative research environment, facilitating widespread knowledge sharing and scaling of innovations across disciplines. We focus on two technology platforms namely laser powder bed fusion (LPBF) and Vat Photopolymerization (VPP).

In LPBF, open-architecture systems enable precise alloy design and microstructural control. By fine-tuning thermal profiles and alloy compositions, we develop materials with targeted properties such as enhanced hardness, corrosion resistance, and ductility. Open LPBF platforms also support in-situ alloying and sensor integration. In VPP, open-architecture systems extend the resolution limits of AM, achieving high-precision components in polymers, ceramics, and metals. The controlled curing depths, viscosity, and exposure in open VPP systems allow for the fabrication of complex structures with excellent resolution.

The talk will discuss how open AM systems are transforming materials and manufacturing by fostering rapid innovation. By moving beyond the restrictions of closed AM models, open architecture facilitates the development of sustainable, high-performance materials tailored to meet diverse research and industrial needs.