



Use of Helios PFIB in Materials Characterization and Engineering for Metallic Additive Manufacturing

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Additive manufacturing of metallic materials has many challenges that include materials engineering, qualification of materials and direct manufacturing of materials. Analytical techniques such as micro-CT, SEM, FIB and TEM are a valuable toolset to characterize materials and help to solve these challenges.

DualBeam FIB-SEM instrumentation has offered new insights to micro- and nano-scale characterization of materials and enabled researchers to better understand a variety of complex materials and engineering questions including atomic structure of materials, interfacial stress or morphological and phase characterization. Material removal rates in a Ga⁺ FIB limit the size and volume of a given material that can be practically characterize to $< 5 \times 10^6 \mu\text{m}^3$. Xe⁺ Plasma Focused Ion Beam-Scanning Electron Microscope (PFIB-SEM) extend the volume of characterization by as much as 60 times.

Thermo Fisher's Helios PFIB is a DualBeam offering an extreme high resolution (XHR) SEM with a Xe⁺ plasma focused ion beam. The system is uniquely suited to provide 2D and 3D characterization techniques for large scale engineering applications (> 100 microns) such as 3D EBSD of large grained metals. This presentation will offer examples of where DualBeam FIB-SEM can provide answers to characterizing the microstructure of materials for additive manufacturing and also be used as a technique for microfabrication of structures at the mesoscale.