

In-situ Laser Modification and Characterization of Materials Using Transmission Electron Microscopy

Laser assisted additive manufacturing enables efficient rapid production of components. Successful laser sintering is dependent on the proper selection of energy, time, throughput, and feedstock characteristics. Ex-situ characterization of additively manufactured components gives insight into the effect of processing conditions on resulting component microstructure and properties, but does not describe changes during the process itself. In contrast, in-situ transmission electron microscopy (TEM) allows for real time imaging in changing systems with nanometer resolution. In this study we have investigated the in-situ laser sintering and grain growth behavior of metal nanoparticles inside the TEM in an effort to better understand the laser sintering process. Metal nanoparticles have been printed on TEM grids and heated in-situ with an infrared laser while imaging with TEM. The observed changes in microstructure and sintering behavior as a function of laser power and time will be discussed for different materials systems.