Characterize Porosity in Selective Laser Melted Inconel 718

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Abstract

Selective laser melting (SLM) is a 3D printing technique that uses a high power-density laser to melt and fuse metallic powders in successive layers to create a solid part. Since the material is melted and re-solidified, inevitable pores are trapped in the part and compromise the part function.

This research characterizes pore density of SLM'ed Inconel by optimizing the laser parameters. Parts were 3D-printed with difference parameters, sectioned, mounted in plastic, ground, and then finish polished with 0.5μm diamond paste. Pore images at different sections were captured with a high resolution microscope and later analyzed with Image-J software. Pore sizes were found to be within 2-130 μm range, and a higher pore density was found near the part circumference but less pore density was seen toward the part center. The minimum pore density was found for laser beam setting at 350 Joule/m energy level and 0.786 m/s scan speed.