

Process Parameter Defect Dataset

Process Parameters

Power

Velocity

Material

Hatch Spacing

Layer Height

Beam Diameter

Melt Pool Dimensions

Simulation

Depth

Length

Width

Experimental

Defect Criterion

Keyhole Porosity

$$\text{Width} / \text{Depth} > 1.5$$

Lack of Fusion Porosity

$$\left(\frac{\text{Hatch Spacing}}{\text{Width}} \right)^2 + \left(\frac{\text{Layer Height}}{\text{Depth}} \right)^2 \leq 1$$

Balling Porosity

$$\text{Length} / \text{Width} < \pi$$

Fine-Tuning

Prompt

Can you detail the potential imperfections that arise in SS316L manufactured via L-PBF at 300 Watts, utilizing a 100 μm beam, traveling at 0.1 m/s, with a hatch spacing of 50 μm , and a layer thickness of 30 μm

LLM

Label

Keyhole Porosity

Lack of Fusion Porosity

Balling Porosity

None