

Determining the Effect of Layer Thickness on Mechanical Properties of Al Si10 Mg Produced by Laser Powder Bed Fusion.

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ABSTRACT

AlSi10Mg is one of the most common Aluminum alloys in used today for Additive Manufacturing. Laser Powder Bed Fusion (LPBF) is the primary Additive Manufacturing technique that uses AlSi10Mg as feed stock. With the availability of higher power lasers, thicker build layers are being used especially for AlSi10Mg. This paper reports on the effects of increasing layer thickness has on the mechanical properties AlSi10Mg produced by LPBF. Microstructural response (especially pore formation) and the resultant mechanical properties are reported. This information is important when combining various layer thicknesses (e.g., 30, 60, and 90 micron layers) for increasing productivity in LPBF while maintaining part quality.

INTRODUCTION

Laser Powder Bed Fusion (LPBF) is an Additive Manufacturing (AM) process where a laser source selectively scans a powder bed according to the CAD-data of the part to be produced. The high intensity laser beam makes it possible to completely melt and fuse the metal powder particles together to obtain almost fully dense parts. Successive layers of metal powder particles are melted and consolidated on top of each other resulting in near-net-shaped parts, other than surface finishing.

Under typical commercially available parameters, LPBF systems operate much less than full power. The laser beam in these systems have a gaussian energy distribution. Due to this gaussian energy distribution, the high fluence at the beam center causes some rapid vaporization of the metal resulting in a recoil event