Minimization of Support Structures in Laser Powder Bed Fusion with Ti-6Al-4V

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Motivation

Laser Powder Bed Fusion (LPBF) is a promising fabrication method in which components are produced with a laser beam out of a metal powder bed without requiring specific tools. However, the process is limited by its low productivity and printability of complex components. This restriction is mainly due to the necessity of additional required support structures. Current literature research shows that further knowledge of the process is needed to deal with support structures and develop minimization methods and efficient design.
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Objectives

Experimental and simulative analysis of the influence of support structures and part geometry on in-process heat conduction

Support Structure and the LPBF Process

In LPBF, the support structure should ensure a successful print result with adequate part quality. For that, additional structure is needed to prevent warping and residual stresses and assist heat flux during fabrication. With this, the thermal effect driven by the selective energy input causing highly dynamic temperature fields and cooling gradients play a significant role.

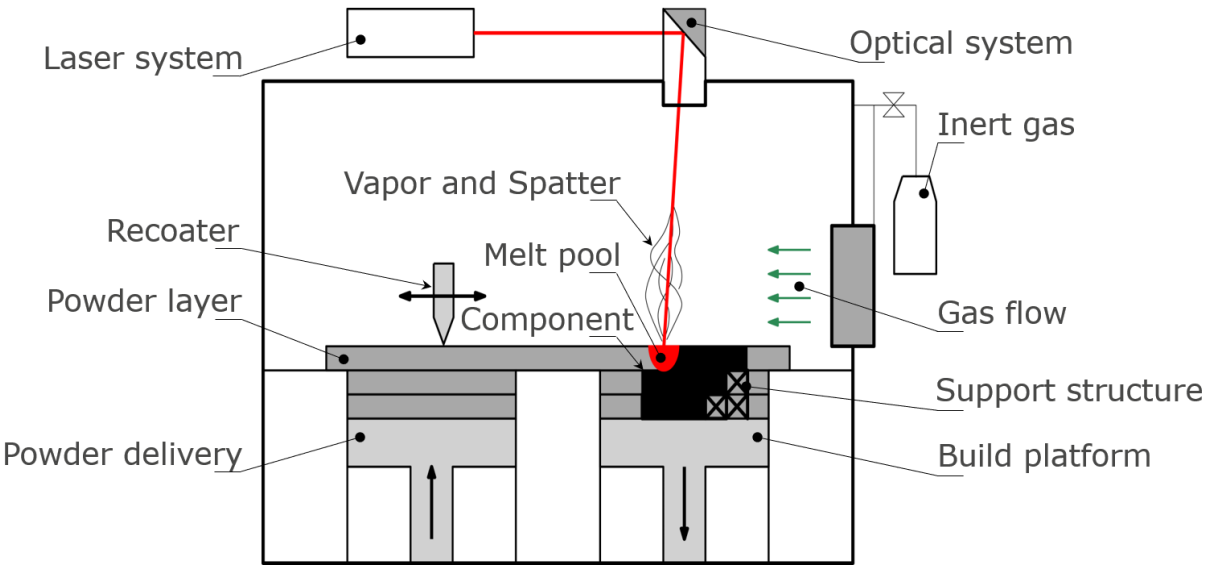

Figure 1: Schematic description of the LPBF Process.

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