Dissertation von Kamilla König-Urban

Additive Fertigung von Nickelbasis-Superlegierungen mittels Laserstrahlschmelzen am Beispiel von Diamalloy 4004NS

Abstract

Additive manufacturing processes such as selective laser melting (SLM) offer considerably more freedom of design than casting. Therefore they are ideal for the manufacturing of highly complex turbine components with new internal cooling structures. However, the high potential of selective laser melting is not fully exploited, mainly due to the small amount of materials qualified for selective laser melting and the lack of knowledge in relation to basic process parameters, laser exposure strategies and hot isostatic pressing as a post-SLM heat treatment. Within the scope of this dissertation both basic process parameters as well as laser exposure strategies are examined. In addition, the influence of hot isostatic pressing on workpiece and material properties of generated Diamalloy 4004NS is analyzed and assessed. The developed methods can be applied to other alloys. Based on this work, the understanding of the selective laser melting process is improved, so that in future an even wider range of applications can be opened up.