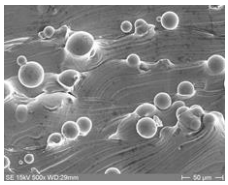
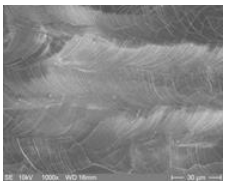
Karlsruhe Institute of Technology

IAM
Institut für Angewandte Materialien



Master – Thesis



Characterization of additively manufactured Ti-6Al-4V submitted to laser polishing

Background:
Additive manufacturing (AM) is a technology that consists on depositing thin layers upon each other, successively, to produce three dimensional (3D) devices or products. The design freedom and reduced waste of material are among the main advantages of the AM. On the other hand, the process has limitations on dimensional control and surface integrity of specific surfaces. In many cases, surface finishing of the parts is mandatory after the AM process. Laser-assisted polishing and surface micromachining present outstanding advantages such as high flexibility, process efficiency, absence of mechanical contact and tool wear, absence of industrial effluents, good accuracy, and capability for localized heat treatment.

Content of the Thesis:
Institute of Applied Materials – Applied Materials Physics (IAM-AWP) carries out research on laser-assisted processes for micro-/nano-structuring and surface functionalization. IAM-AWP is developing new approaches of laser-assisted polishing of metallic AM parts in frame of European funded project PAM^2 (Precision Additive Metal Manufacturing).
The goal of the master thesis is to support the research activities in the field of laser-assisted polishing by means of chemical and microstructural analysis in order to characterize the modified material properties of AM Ti-6Al-4V samples as function of laser and process parameters. Finally, process strategies with defined surface functionalities (hardness, roughness, internal stress) will be established.
For this purpose, surface analysis (topography), mechanical characterization (hardness), and metallographic cross section analysis (microstructure) have to be performed. Furthermore, data achieved from XRD analysis have to be considered for describing the resulting phases and internal stress. The candidate will be involved in laser materials processing and execution of the experiments in parallel to the analytic work. The aim of this work is to evaluate the material properties (i.e., hardness, surface roughness, chemical composition) and microstructural information (phases, orientation, heat affected zones and defects) assigned to laser polishing and in comparison to the original state of the samples (as-built).

Do you want to get insights into an exciting research project and incorporate your own ideas? Then we are looking forward to your application!

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