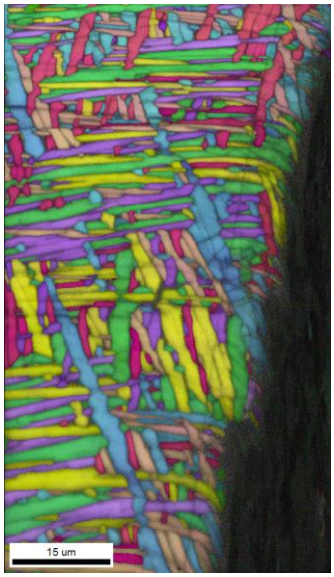
Institute of Materials Science, Joining and Forming
Kopernikusgasse 24/I, 8010 Graz

Announcement of a Master's Thesis, 01.08.2022
Influence of the additive manufacturing process on the mechanical properties of Ti-6Al-4V

Description



Additive manufacturing (AM) comprises different processes which deal with different materials using different heat sources to build-up structural parts. Depending on the type of process, the mechanical properties during static and cyclic loading can be influenced mainly by (1) segregation of alloying elements or contamination (inclusions, oxide formation), (2) volume defects and (3) the microstructure. In additive manufacturing, defects are mainly related to porosity affected by the process parameters and the type of adding material, cracks formation due to residual stresses generated during the process and lack of fusion, among others. On the other hand, the variety of microstructure has a significant role in the mechanical properties of components. Ti-6Al-4V is a well known titanium alloy with special application for aerospace components. This alloy is very sensitive to thermal cycles provoked by the type of additive manufacturing processing.

This work focuses on the characterization of AM components (single walls) fabricated by **3 different wire feed directed energy deposition-arc** (DED-arc) processes: metal inert gas (CMT), plasma and electron beam technologies.

Activities

- Literature Research of AM Titanium alloys, with special focus on alpha+beta alloys and Ti-6Al-4V
- Component preparation by EBAM (Wire feed electron beam additive manufacturing)
- Metallography characterization (LOM, SEM, EBSD) to determine microstructural features and defects related to the process for three processes (CMT, PW, EBAM).
- Mechanical testing (Hardness, Tensile tests, Impact Tests) for three processes (CMT, PW, EBAM)
- Analysis and Interpretation of the results.
- Documentation in master thesis and journal publication.

Organisation

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Duration: 6 months

Location: IMAT, Joining technology group (Neue Technik)

Reward: € 2.500 + € 500 performance bonus for an excellent success

Further information

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