

# SEM Image Processing Based Characterization of Additively Manufactured Ti6Al4V-Cu Implant Material

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Titanium alloys are often used for bone implants due to their good mechanical properties, biocompatibility and corrosion resistance. However, the implants are susceptible to infection, leading to implant failure and costly revision surgery. As a possible solution, copper (Cu), which is known to have an antibacterial function<sup>1</sup>, can be added to the titanium alloy system by additive manufacturing methods. In this work, laser beam directed energy deposition (DED-LB) of in situ mixed Ti6Al4V with 4 wt% Cu metal powders was used to manufacture an antibacterial alloy in the form of a multilayer thin wall on a Ti6Al4V substrate. A full factorial experimental design with three levels of initial laser power, two laser power strategies and two deposition path strategies was carried out to investigate the influence of the main deposition parameters and strategies. Image processing of the acquired SEM images was used to quantify the content of Cu-rich phases in the resulting alloys. The latter showed a dependence not only on the parameters and strategies tested, but also on the location, which can be attributed to the location-dependent temperature profile of the sample produced in the DED-LB process.

**Acknowledgement:** The authors acknowledge the project BIOAD, Antibacterial alloys: development by additive 3D manufacturing, characterization and clinical applications, J7-4639 funded by the Slovenian Research Agency.

1. Zhuang Y, Ren L, Zhang S, Wei X, Yang K, Dai K, *Acta Biomater.*, **2021**, 119, 472-484.