Euro PM2021 Congress, Online, 18-22 October 2021

Influence of z-increment on the build height, porosity and microstructure of laser deposited WC-10wt%FeCr thin walls

Molobi, E; Sacks, N and Theron, Maritha

Abstract:
The influence of z-increment on profile, porosity and microstructure of WC-10wt%FeCr single walls deposited using direct energy deposition was studied. Traverse speeds of 3.2 and 6.4 mm/s were used, while laser power was varied at 200, 300 and 400 W and powder feed rate varied between 7.3, 10 and 12.2 g/min. A z-increment equal to the layer thickness, where the laser is in its focused state leading to increased laser-powder interaction, resulted in an increase in sample porosity and height. The microstructure had a banded structure consisting of two alternating layers characterized by their different WC grain morphologies arising from the in-situ heat treatment during layer deposition. It was observed that the z-increment was critical in preventing a defocused laser. An incorrect z-increment leads to less powder being captured in the molten pool, the dynamics of which influence the type of pores created and the resultant alloy microstructure.