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Energy input effects on microstructure evolution of Ti- 6Al-4V fabricated by electron beam additive manufacturing

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In recent years, additive manufacturing (AM) technology, especially powder bed fusion method has been well developed. One of the powder bed fusion technologies is called electron beam additive manufacturing (EBAM). The microstructure of EBAM parts of the Ti-6Al-4V alloy is usually characterized by the acicular martensitic alpha ( ) and fine lamellar Widmanstätten (+) structure inside the prior grain. However, there are challenges to control the volume fractions between different phases during this process. In this study, the effect of energy input on the microstructure of Ti-6Al-4V samples fabricated by EBAM is examined. The processing parameters of energy input are designed by the prediction of thermal field simulation. The relationship between the current input and the microstructure evolution is clarified by analyzing the volume fractions of different phases and the mechanical properties. The results show that the energy input would influence the microstructure of the samples made by EBAM and thus would differ in the mechanical properties accordingly.

Recent Publications

1. **M Thomas, G J Baxter and I Todd (2016) Normalised model-based processing diagrams for additive layer manufacture of engineering alloys. Acta Materialia 108:26-35.**
2. **S L Sing, J An, W Y Yeong and F E Wiria (2016) Laser and electron-beam powder-bed additive manufacturing of metallic implants: a review on processes, materials and designs. Journal of Orthopaedic Research 34(3):369-385.**
3. **P Wang, X Tan, M L S Nai, S B Tor and J Wei (2016) Spatial and geometrical-based characterization of microstructure and microhardness for an electron beam melted Ti–6Al–4V component. Materials & Design 95:287-295.**
4. **X Zhao, S Li, M Zhang, Y Liu, T B Sercombe, S Wang, Y Hao, R Yang and L E Murr (2016) Comparison of the microstructures and mechanical properties of Ti–6Al–4V fabricated by selective laser melting and electron beam melting. Materials and Design 95:21-31.**

Biography

M T Tsai is a Postdoctoral fellow in the 3D Printing Medical Research Institute at Asia University in Taiwan. He has completed his PhD at National Sun Yat-sen University, Republic of China in 2018. His research fields include nano/micro scaled mechanical behavior and microstructure. Currently, his main research is focused on aluminum- scandium alloys by additive manufacturing.

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