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Authors: Bintao Wu, Donghong Ding, Zengxi Pan, Dominic Cuiuri, Huijun Li, Jian Han, Zhenyu Fei

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Effects of heat accumulation on the arc characteristics and metal transfer behavior in Wire Arc Additive Manufacturing of Ti6Al4V

Bintao Wu, Donghong Ding, Zengxi Pan *, Dominic Cuiuri, Huijun Li, Jian Han, Zhenyu Fei,

School of Mechanical, Materials, Mechatronic and Biomedical Engineering, University of Wollongong, Wollongong NSW 2522, Australia

*Corresponding author:

Zengxi Pan; Tel: +61-2-42215498; Email address: zengxi@uow.edu.au; (Z. Pan).

ABSTRACT

Wire arc additive manufacturing (WAAM) offers a promising alternative to traditional subtractive manufacturing of metallic components, particularly in the case of large Ti6Al4V structures for the aerospace sector that feature high buy-to-fly ratios. This study investigates the influence of heat accumulation on bead formation, arc stability, and metal transfer behaviour during the manufacture of Ti6Al4V with the gas tungsten wire arc additive manufacturing (GT-WAAM) using localized gas shielding. An infrared pyrometer is used to measure the in-situ interpass temperature which is a key factor in determining the heat accumulation. Arc stability and metal transfer behaviour are monitored by means of a high speed camera. The results show that due to the various thermal dissipation paths along the building height, there exists a significant difference in temperature variation between substrate and in-situ layer.