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Mechanical Properties of Hybrid Ti6Al4V Part with Wrought Alloy to Powder-Bed Additive Manufactured Interface

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Abstract : In recent years, the implementation and use of Metal Additive Manufacturing (AM) parts increase. As a result, the demand for bigger parts rises along with the desire to reduce it's the production cost. Generally, in powder bed Additive Manufacturing technology the part size is limited by the machine build volume. In order to overcome this limitation, the parts can be built in one or more machine operations and mechanically joint or weld them together. An alternative option could be a production of wrought part and built on it the AM structure (mainly to reduce costs). In both cases, the mechanical properties of the interface have to be defined and recognized. In the current study, the authors introduce guidelines on how to examine the interface between wrought alloy and powder-bed AM. The mechanical and metallurgical properties of the Ti6Al4V materials (wrought alloy and powder-bed AM) and their hybrid interface were examined. The mechanical properties gain from tensile test bars in the built direction and fracture toughness samples in various orientations. The hybrid specimens were built onto a wrought Ti6Al4V start-plate. The standard fracture toughness (CT25 samples) and hybrid tensile specimens' were heat treated and milled as a post process to final diminutions. In this Study, the mechanical tensile tests and fracture toughness properties supported by metallurgical observation will be introduced and discussed. It will show that the hybrid approach of utilizing powder bed AM onto wrought material expanding the current limitation of the future manufacturing technology.

Keywords : additive manufacturing, hybrid, fracture-toughness, powder bed
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