

Feasibility study of manufacturing TiAl parts with electron beam melting: a pathway towards additively manufacturing complex engine components

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Titanium aluminide alloys based on the γ -TiAl phase have been of great interest owing to their high specific strength, good strength retention and good corrosion and oxidation resistance at high temperatures. However, their brittle nature makes them hard to manufacture and machine using conventional techniques. Additive manufacturing is a promising alternative for the manufacture of complex geometries with its near net shape manufacturing capability. In this feasibility work, TiAl preforms have been manufactured using the electron beam melting technique. Mechanical testing was performed both at room and high temperature. Characterization experiments were performed to assess the constituent phases, residual stresses, microstructures and grain orientations. Effect of process conditions on the resultant microstructures and microstructure-mechanical property relations are discussed.