

ADDITIVE MANUFACTURE AND MATERIAL PROPERTY ANALYSIS OF CRACK-FREE ELECTRON BEAM MELTED PURE TUNGSTEN

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Abstract

Pure tungsten is a refractory metal and has been gaining interest for the use in nuclear fusion reactors as a plasma facing material. This material suffers from poor machinability due to being brittle at room temperature. Additive manufacturing (AM) is a layer-by-layer manufacturing method that is fundamentally different than formative or subtractive. Since the AM process is highly variable, the process and the resulting material properties need analysis. This talk discusses the use of Electron Beam Powder Bed Fusion machine parameters that allow the processing of that yields high density (>99%) tungsten. The build substrate and support structures are critical in the production of the final part. Energy densities greater than 400 J/mm^3 led to >99% relative density of pure tungsten. Material properties of the tungsten parts are reported and compared to conventionally manufactured tungsten. These experiments outline the challenges of manufacturing this refractory metal with this AM technology.