Effects of heat treatment on microstructure and mechanical properties of wire arc additively manufactured Hastelloy C276 alloy

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Hastelloy C276 is a Ni-Cr-Mo based superalloy which has a high potential for application in high temperature and extreme corrosive environment due to its high corrosion resistance and excellent mechanical properties. In this research, the wire arc additive manufacturing (WAAM) process was successfully used to fabricate the defect-free Hastelloy C276 component. The microstructure of the component was characterized using optical microscopy, scanning electron microscopy (SEM) equipped with energy dispersive X-ray spectroscopy (EDS), transmission electron microscopy (TEM), and X-ray diffraction, the mechanical properties were evaluated via tensile and hardness tests. The as-deposited component exhibited anisotropy on both microstructure and mechanical properties. The influences of solid solution heat treatment and stress relief heat treatment on microstructure and mechanical properties were also investigated. It was found that both microstructure and mechanical properties were significantly modified after heat treatment. Preliminary creep tests indicted the texture has a strong influence on the creep performance of the component.

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