Binder Jet Additive Manufacturing of Copper C18150

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ABSTRACT

C18150 is a copper alloy containing chromium and zirconium as the primary alloying elements. The alloy can be heat treated by a precipitation hardening mechanism, which also increases the conductivity of the material compared to the solutionized condition. The alloy's combination of strength, hardness, and conductivity make it an attractive selection in thermal transfer applications where the stresses may be too high for unalloyed copper. This work examines the results of binder jet printing three different C18150 powders. The powders were characterized to understand their particle size distribution, morphology, and rheological characteristics. Debind and sintering profiles were optimized for each powder to achieve high sintered density. Sintered parts printed from each powder were subsequently subjected to heat treatment and were characterized with respect to residual interstitials, microstructure, conductivity, and mechanical properties.

INTRODUCTION

Copper possesses high electrical and thermal conductivity, making it a desirable material for current and heat transfer components. It has become a material of great interest for additive manufacturing (AM). Heat transfer components stand to gain benefits from complex geometries that improve efficiency and would not be feasible to produce by traditional manufacturing methods [1-7]. Previous work has shown the