Residual Stress Mapping of As built and hot isostatic pressure treated GRCop-84 as fabricated by selective laser melting.

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GRCop-84, a copper alloy developed by NASA Glenn Research Center with the starting At% Cu-8 Cr-4 Nb, has a copper matrix with a fine intermetallic dispersion of Cr2Nb (cubic Laves phase C15). The alloy is being developed for high-heat-flux applications and has excellent high temperature properties including retention of tensile strength at high temperatures, high thermal conductivity, and excellent creep resistance. GRCop-84 has shown higher survivability rates than other metal additive alloys, good surface finish, and requires less operator tweaking for builds, and this is not fully understood. Neutron diffraction provides an accurate, non-destructive method of measuring the thermal stresses accumulated during production; the primary source of failure before annealing. The unstressed lattice spacing (d_0), residual stress, and distribution have been characterized for simple shapes in HIP and as-built conditions made with SLM, a powder bed fusion method, with the HIP samples showing significantly reduced stresses concentrations than the as-built.