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M1Or2C-07: Tensile properties of the HEA CoCrFeMnNi at 4 Kelvin

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The High-Entropy Alloy (HEA) CoCrFeMnNi, an fcc alloy has been shown to exhibit remarkable properties at cryogenic temperatures, including high toughness as well as an increase in both yield strength and ductility as temperature is decreased to 77 Kelvin. A considerable number of applications require materials with such properties down to 4 Kelvin. For example, liquid hydrogen storage tanks used in aerospace applications require materials which retain their high strength and ductility. Here we present measurements of the yield strength and elongation to failure of CoCrFeMnNi at room temperature, 77 Kelvin, and 4 Kelvin, which show that CoCrFeMnNi retains its high strength and ductility at 4 Kelvin. Despite similar yield strength and elongation to failure at 77 Kelvin and 4 Kelvin, SEM and EBSD measurements show differences in deformation mechanisms that are discussed.

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