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Cyclic stress-strain response of directionally solidified polycrystalline Cu-Al-Ni shape memory alloys

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Abstract: Our previous study developed a polycrystalline Cu-Al-Ni alloy by directional solidification, which exhibits excellent superelasticity. To further verify the application feasibility of the Cu-Al-Ni alloy, cyclic superelastic behaviors of the alloy under varying loading frequencies and strain amplitudes were investigated in this study. The results show that the superelasticity of the polycrystalline Cu-Al-Ni alloy has ultra-low dependence on loading frequency in a range of 0.005~5Hz. The alloy can sustain over 2000 tensile cycles at the applied total strain of 4%, exhibiting 1750 cycles and 825 cycles for total strain of 6% and 8%, respectively. The normalized critical stress and strain vary only ~ 10% and ~ 0.03% after 2000 times of loading-unloading with a strain amplitude of 4%. Compared with the commercial polycrystalline Ni-Ti alloy, the directionally solidified Cu-Al-Ni alloys with columnar

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