

Accepted Manuscript

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PII: S0925-8388(17)31444-5

DOI: [10.1016/j.jallcom.2017.04.234](https://doi.org/10.1016/j.jallcom.2017.04.234)

Reference: JALCOM 41638

To appear in: *Journal of Alloys and Compounds*

Received Date: 10 September 2016

Revised Date: 21 December 2016

Accepted Date: 21 April 2017

Please cite this article as: H. Fu, S. Xu, H. Zhao, H. Dong, J. Xie, Cyclic stress-strain response of directionally solidified polycrystalline Cu-Al-Ni shape memory alloys, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.04.234.

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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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