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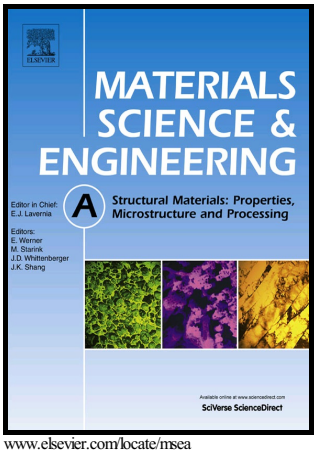

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PII: S0921-5093(17)31519-8
DOI: http://dx.doi.org/10.1016/j.msea.2017.11.058
Reference: MSA35773

To appear in: *Materials Science & Engineering A*

Received date: 16 October 2017
Revised date: 14 November 2017
Accepted date: 15 November 2017

Cite this article as: Z.G. Zhu, Y.F. Sun, F.L. Ng, M.H. Goh, P.K. Liaw, H. Fujii Q.B. Nguyen, Y. Xu, C.H. Shek, S.M.L. Nai and J. Wei, Friction-stir welding of a ductile high entropy alloy: microstructural evolution and weld strength *Materials Science & Engineering A* http://dx.doi.org/10.1016/j.msea.2017.11.058

Friction-stir welding of a ductile high entropy alloy: microstructural evolution and weld strength

Z. G. Zhu[a,b], Y. F. Sun[c], F. L. Ng[a], M. H. Goh[a], P. K. Liaw[d], H. Fujii[c], Q. B. Nguyen[a], Y. Xu[b], C. H. Shek[b,*], S. M. L. Nai[a,*], J. Wei[a,*]

[a]Singapore Institute of Manufacturing and Technology, Singapore

[b]Department of Physics and Materials Science, City University of Hong Kong, Hong Kong, China

[c]Joining and Welding Research Institute, Osaka University, Japan

[d]Department of Materials Science and Engineering, The University of Tennessee, Knoxville, TN 37996, USA

Abstract

High entropy alloys (HEAs) are a novel subset of metallic systems with complex compositions usually yielding simple phase formation. To verify their potential engineering applications, a novel $Co_{16}Fe_{28}Ni_{28}Cr_{28}$ HEA with a low content of expensive Co was developed and its welding characteristics through friction-stir welding (FSW) were investigated. The HEA shows a stable face-centered-cubic (FCC) structure with an excellent ductility of about 70%. The microstructural evolution during FSW was dominated by discontinuous recrystallization through grain bulging and the $B/\overline{B}$ {112}<110> shear texture formed in the stir zone (SZ). A white band (WB) containing W-rich and Cr-rich phases was detected in the SZ. The WB exhibited refined grains compared with the normal SZ, which may be associated with the particle-stimulated nucleation (PSN). The present understanding of the microstructural evolution during FSW of HEAs may help tailor the weld properties to pave the way for their engineering applications.