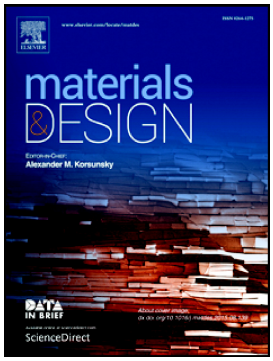

Enhanced strength and ductility of bulk CoCrFeMnNi high entropy alloy having fully recrystallized ultrafine-grained structure

S.J. Sun, Y.Z. Tian, H.R. Lin, X.G. Dong, Y.H. Wang, Z.J. Zhang, Z.F. Zhang

PII: S0264-1275(17)30730-X
DOI: doi: 10.1016/j.matdes.2017.07.054
Reference: JMADE 3244

To appear in: *Materials & Design*

Received date: 19 April 2017
Revised date: 24 July 2017
Accepted date: 25 July 2017

Please cite this article as: S.J. Sun, Y.Z. Tian, H.R. Lin, X.G. Dong, Y.H. Wang, Z.J. Zhang, Z.F. Zhang , Enhanced strength and ductility of bulk CoCrFeMnNi high entropy alloy having fully recrystallized ultrafine-grained structure, *Materials & Design* (2017), doi: 10.1016/j.matdes.2017.07.054

Enhanced strength and ductility of bulk CoCrFeMnNi high entropy alloy having fully recrystallized ultrafine-grained structure

S.J. Sun [a, b], Y.Z. Tian [a *] H.R. Lin [a, b], X.G. Dong [c], Y.H. Wang [d], Z.J. Zhang [a] and Z.F. Zhang [a, b *]

[a] *Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese Academy of Sciences, Shenyang 110016, China*

[b] *School of Materials Science and Engineering, University of Science and Technology of China, Hefei 230026, China*

[c] *School of Materials Science and Engineering, Shenyang Ligong University, Shenyang 110159, China*

[d] *National Engineering Research Center for Equipment and Technology of Cold Strip Rolling, Yanshan University, Qinhuangdao 066004, China*

Abstract

A high efficient magnetic levitation melting technique was reported for fabricating bulk equiatomic CoCrFeMnNi high-entropy alloy (HEA) ingot with a diameter of 110 mm. The bulk ingot can be either forged or rolled. In particular, fully recrystallized ultrafine-grained (UFG) HEA with a minimum grain size of 503±181 nm was successfully obtained through a simple cold rolling and annealing process. The tensile properties of the HEA were studied by changing the grain size from the UFG regime to the coarse-grained regime. The UFG HEA exhibited a good balance of strength and ductility due to the low stacking fault energy. The linear Hall-Petch relationship was well fitted when the grain sizes range from 503 nm to 88.9 μm.

Keywords: High-entropy alloy (HEA); Ultrafine grain; Hall-Petch relationship; Strength; Ductility

* Corresponding author. Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese Academy of Sciences, Shenyang 110016, PR. China.

E-mail address: yztian@imr.ac.cn (Y.Z. Tian), zhfzhang@imr.ac.cn (Z.F. Zhang).