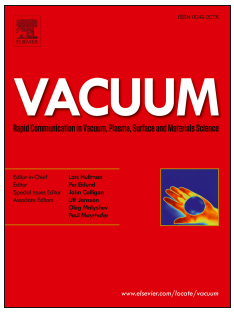
Accepted Manuscript



Optimization of mechanical and tribological properties of FCC CrCoNi multi-principle element alloy with Mo addition

Junwei Miao, Tieming Guo, Junfang Ren, Aijun Zhang, Bo Su, Junhu Meng

PII: S0042-207X(17)31488-4

DOI: 10.1016/j.vacuum.2018.01.012

Reference: VAC 7761

To appear in: *Vacuum*

Received Date: 26 October 2017

Revised Date: 11 December 2017

Accepted Date: 7 January 2018

Please cite this article as: Miao J, Guo T, Ren J, Zhang A, Su B, Meng J, Optimization of mechanical and tribological properties of FCC CrCoNi multi-principle element alloy with Mo addition, *Vacuum* (2018), doi: 10.1016/j.vacuum.2018.01.012.

Optimization of mechanical and tribological properties of FCC CrCoNi multi-principle element alloy with Mo addition

Junwei Miao[a,b], Tieming Guo[a,*], Junfang Ren[b], Aijun Zhang[b], Bo Su[b], Junhu Meng[b,*]

[a]State Key Laboratory of Advanced Processing and Recycling of Nonferrous Metals, Lanzhou University of Technology, Lanzhou 730050, P.R. China

[b]State Key Laboratory of Solid Lubrication, Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, Lanzhou 730000, P.R. China

* Corresponding author. E-mail addresses: guotm@lut.cn; jhmeng@licp.cas.cn

Abstract

A new multi-principle element alloy system, $CrCoNiMo_x$, is designed by adding Mo in FCC CrCoNi alloy to improve the strength and wear resistance. The addition of Mo causes severe lattice distortion of the alloys and promotes the formation of intermetallic phases. With the increase of Mo content, the hardness and compressive yield strength of the $CrCoNiMo_x$ alloys increase obviously from 244 HV and 518 MPa to 656 HV and 1973 MPa, respectively, whereas the plasticity decreases because the intermetallic compounds are hard but brittle. As a result of the competition between the solid solution strengthening of Mo and the embrittlement of the intermetallic compounds, the fracture toughness of the alloys firstly increases and then decreases with the Mo content. The wear resistance of the alloys is significantly increased with the Mo content and shows a slight increase when the x exceeds 0.5, because the wear mechanism of the alloys is changed from abrasive wear to adhesive wear and brittle fracture gradually. This study provides a new insight for the design of high strength and wear resistant alloys for engineering applications.