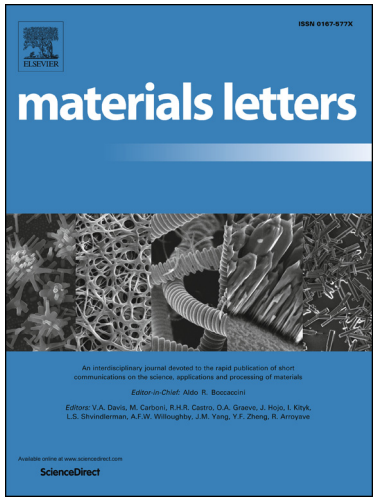

Effect of Cu on microstructure evolution and mechanical properties of Fe-Nb dissimilar welds

Qiaoling Chu, Min Zhang, Jihong Li, Fuxue Yan, Cheng Yan

PII: S0167-577X(18)31465-4
DOI: https://doi.org/10.1016/j.matlet.2018.09.086
Reference: MLBLUE 24954

To appear in: *Materials Letters*

Received Date: 28 August 2018
Revised Date: 8 September 2018
Accepted Date: 16 September 2018

Please cite this article as: Q. Chu, M. Zhang, J. Li, F. Yan, C. Yan, Effect of Cu on microstructure evolution and mechanical properties of Fe-Nb dissimilar welds, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.09.086

Effect of Cu on microstructure evolution and mechanical properties of Fe-Nb dissimilar welds

Qiaoling Chu[ab*], Min Zhang[a]*, Jihong Li[a], Fuxue Yan [a], Cheng Yan[b]

a College of Materials Science and Engineering, Xi'an University of Technology, Xi'an, 710048, China.

b School of Chemistry, Physics and Mechanical Engineering, Science and Engineering Faculty, Queensland University of Technology (QUT), Brisbane, QLD 4001, Australia.

ABSTRACT

In this paper, we report a thorough study of phase formation in Fe-Nb weld metals using a combination of microscopy and composition analysis. The correlation of microstructure and mechanical properties was established by nanoindentation. A simplified scenario of weld formation was proposed. Nb weld metal was dominated by the coarse Laves phase (Fe_2Nb) with high hardness (~20.4GPa). With the addition of Cu, sound weld metal was obtained with alternative distribution of α-Fe, Cu phases and fine eutectic phases (α-Fe+Fe_2Nb). These transformation products with lower hardness (α-Fe+Fe_2Nb~11.6GPa) improved the overall mechanical properties of the weld metal.

Keywords: Microstructure; Intermetallics; Phase transformation; Nanoindentation.

1. Introduction

Welding of dissimilar materials is continuously attracting attention by the industry because of its potential benefits on increasing design flexibility and reducing cost [1]. Niobium (Nb) is a refractory metal which has many desirable properties that make them suitable for numerous engineering applications [2]. The Fe-Nb binary phase

* Corresponding author: chuqiaoling@xaut.edu.cn (Dr. Qiaoling Chu), zhmmn@xaut.edu.cn (Prof. Min Zhang).