## Accepted Manuscript

Title: Achieving ultra-high strength friction stir welded joints of high nitrogen stainless steel by forced water cooling

Authors: H. Zhang, D. Wang, P. Xue, L.H. Wu, D.R. Ni, B.L. Xiao, Z.Y. Ma

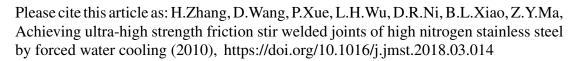
PII: S1005-0302(18)30076-8

DOI: https://doi.org/10.1016/j.jmst.2018.03.014

Reference: JMST 1222

To appear in:

Received date: 1-12-2017 Revised date: 22-2-2018 Accepted date: 19-3-2018



This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Achieving ultra-high strength friction stir welded joints of

high nitrogen stainless steel by forced water cooling

H. Zhang<sup>a,b</sup>, D. Wang<sup>a,\*</sup>, P. Xue<sup>a</sup>, L.H. Wu<sup>a</sup>, D.R. Ni<sup>a</sup>, B.L. Xiao<sup>a</sup>, Z.Y. Ma

<sup>a</sup> Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese

Academy of Sciences, 72 Wenhua Road, Shenyang 110016, China

<sup>b</sup> University of Chinese Academy of Sciences, 19 Yuquan Road, Beijing 100049, China

\* Corresponding authors.

E-mail addresses: dongwang@imr.ac.cn (D. Wang), zyma@imr.ac.cn (Z.Y. Ma)

[Received 1 December 2017; revised 22 February 2018; accepted 19 March 2018]

Abstract

The microstructure and properties of water-cooled and air-cooled friction stir welded

(FSW) ultra-high strength high nitrogen stainless steel joints were comparatively studied.

With additional rapid cooling by flowing water, the peak temperature and duration at elevated

temperature during FSW were significantly reduced. Compared to those in the air-cooled joint,

nugget zone with finer grains (900 nm) and heat affected zone with higher dislocation density

were successfully obtained in the water-cooled joint, leading to significantly improved

mechanical properties. The wear of the welding tool was significantly reduced with water

cooling, resulting in better corrosion resistance during the immersion corrosion test.

**Keywords:** Friction stir welding; stainless steels; mechanical properties; corrosion

1. Introduction

Low nickel and nickel-free high nitrogen stainless steels (HNSs) have recently been

developed, aimed at reducing the amount of expensive alloy elements and improving the

mechanical properties and localized corrosion resistance. Nitrogen, as a powerful austenite

## Download English Version:

## https://daneshyari.com/en/article/7951850

Download Persian Version:

https://daneshyari.com/article/7951850

<u>Daneshyari.com</u>