Accepted Manuscript

Title: Consumable Selection for Arc Welding between Stainless Steel 410 and Inconel 718

Author: Fatemeh Hejripour Daryush K. Aidun

PII: S0924-0136(17)30057-2
DOI: http://dx.doi.org/doi:10.1016/j.jmatprotec.2017.02.013
Reference: PROTEC 15125

To appear in: *Journal of Materials Processing Technology*

Received date: 26-7-2016
Revised date: 21-2-2017
Accepted date: 21-2-2017

Please cite this article as: Hejripour, F., Aidun, D.K.,Consumable Selection for Arc Welding between Stainless Steel 410 and Inconel 718, *Journal of Materials Processing Technology* (2017), http://dx.doi.org/10.1016/j.jmatprotec.2017.02.013

Consumable Selection for Arc Welding between Stainless Steel 410 and Inconel 718

Fatemeh Hejripour[1], Daryush K. Aidun[1*]

[1]Mechanical and Aeronautical Engineering Department, Clarkson University, 8 Clarkson Ave., Potsdam, NY 13699-5725, United States

[*]Corresponding author: dka@clarkson.edu, (315) 268 6518

Abstract

Dissimilar welding was achieved between martensitic stainless steel type AISI 410 and Inconel 718 using Cold Wire Gas Tungsten Arc Welding (CW-GTAW). Two types of consumables namely 718-410 and 82-410 were selected for this study. In both weldments, the microstructure investigation showed fully austenitic weldments with formation of secondary phases. Secondary phases were present in the heat affected zone (HAZ) of 718, and an unmixed melted zone (UMMZ) was observed on the 410 interface. The hardness of the secondary phases and UMMZ were determined using nano-indentation, and results revealed higher hardness in these regions compared to the weld zone (WZ) matrix. The UMMZ was removed by arc current enhancement. Mechanical examinations indicated that secondary phases and UMMZ did not significantly affect tensile strength and resistance to plastic deformation. However, investigation revealed that secondary phases can have a detrimental effect on ductility. Filler wire 82-410 demonstrated improved mechanical properties compared to filler 718-410 at room temperature and resulted in a stronger weld compared to 410 base metal (BM).

Keywords: Dissimilar welds, Inconel 718, Stainless steel 410, Secondary phases, Hardness, Nano-indentation

1 Introduction

Martensitic stainless steels such as Alloy 410 and nickel based super alloys such as Alloy 718 have good mechanical and corrosion properties. These alloys are widely used in high temperature and corrosive environments within the chemical and power industries, and for the manufacturing of blades in compressors and turbines. A specific application of welding a martensitic stainless steel to a nickel base super alloy is used for the development