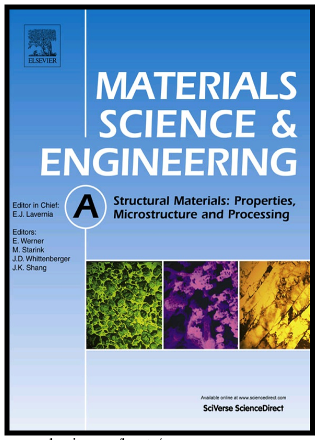
Author's Accepted Manuscript



www.elsevier.com/locate/msea

"MECHANICAL PROPERTIES OF DISSIMILAR STEEL-ALUMINUM WELDS"

Anton Evdokimov, Aleksei Obrosov, Ralf Ossenbrink, Sabine Weiß, Vesselin Michailov

PII: S0921-5093(18)30356-3
DOI: https://doi.org/10.1016/j.msea.2018.03.019
Reference: MSA36212

To appear in: *Materials Science & Engineering A*

Received date: 7 November 2017
Revised date: 3 March 2018
Accepted date: 5 March 2018

Cite this article as: Anton Evdokimov, Aleksei Obrosov, Ralf Ossenbrink, Sabine Weiß and Vesselin Michailov, "MECHANICAL PROPERTIES OF DISSIMILAR STEEL-ALUMINUM WELDS", *Materials Science & Engineering A,* https://doi.org/10.1016/j.msea.2018.03.019

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 galley proof before it is published in its final citable 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.

ACCEPTED MANUSCRIPT

"MECHANICAL PROPERTIES OF DISSIMILAR STEEL-ALUMINUM WELDS"

Anton Evdokimov*[1], Aleksei Obrosov[2], Ralf Ossenbrink[1], Sabine Weiß[2], Vesselin Michailov[1]

*Corresponding Author, anton.evdokimov@b-tu.de , LG 3B-306, Siemens-Halske-Ring 6, 03046, Cottbus, Germany

[1] Department of Joining Technology, Brandenburg University of Technology Cottbus - Senftenberg, 03046, Cottbus, Germany

[2] Chair of Physical Metallurgy and Materials Technology, Brandenburg University of Technology Cottbus - Senftenberg , 03046, Cottbus, Germany

Abstract

Knowledge of the properties of dissimilar welds is of great significance for the development of multi-material lightweight structures. In this study, stainless steel (1.4301) and aluminum alloy (6082-T6) sheets were welded in overlap configuration in keyhole mode. The resulting weld metals were investigated with respect to their mechanical properties. Several samples were cut out of different locations along the welds and their cross-sections were subjected to indentation testing and energy dispersive X-ray (EDS) analysis. Young's modulus E, yield stress σ_y, and strain hardening exponent n, were determined by means of reverse analysis of the indentation load (P) – depth (h) curves, allowing construction of true stress – true strain relations. An essential increase in yield stress in comparison to the one of the base alloys was observed inside the weld metal. In contrary, Young's modulus and strain hardening exponent of the welds were almost identical to corresponding values of the base steel metal. Due to the sensitivity of yield stress to the aluminum content, slight variations of the welding parameters lead to significant changes in elastic-plastic behavior of the weld metal.

Keywords: Mechanical properties, Indentation, Reverse analysis, EDS measurements, Dissimilar steel aluminum welding, FEM

Accepted manuscript

Introduction

Growing needs for steel-aluminum hybrid structures having good ratio of mechanical properties to production costs, lead to the development of new various welding techniques for these materials [1–6]. Especially, great importance was lately focused on laser welding in overlap configuration in key-hole mode [7–14]. In these studies, simple one pass laser welding [7–10] as well as more advanced techniques such as pulsed laser welding [11], laser welding using pre-placed activating flux [12], two pass laser welding [13] and laser welding with a magnetic field perpendicular to the welding direction [14] were used for joining of different steel-aluminum alloys combinations.

One of the earliest research investigating the basic features of this type of welding was conducted by Sierra et al. [7]. They studied joining of low carbon steel onto 6000 series aluminum alloy. It was

Download English Version:

https://daneshyari.com/en/article/7972809

Download Persian Version:

https://daneshyari.com/article/7972809

Daneshyari.com