Electrochemical and surface studies of 0.95 Mg-Al-alloy and pure copper joints prepared using friction stir welding with low-medium-high tool travel speeds

Neetesh Soni, Yang Yaocheng, Adepu Kumar, Yin Caihong, Liu Li, Ambrish Singh*, Yuanhua lin

1 School of Materials Science and Engineering, Southwest Petroleum University, 8 Xindu district-610500, Chengdu city, Sichuan province, China.

2 Department of Mechanical Engineering, National Institute of Technology, Warangal, India

*E-mail: vishisingh4uall@gmail.com; drambrishsingh@gmail.com

doi: 10.20964/2019.09.46

Received: 2 April 2019 / Accepted: 2 July 2019 / Published: 31 July 2019

Friction stir welding (FSW) is a technique currently used by weldment industries. In this study, FSW was used to join two dissimilar metals, copper and 0.95 Mg-Al-alloy. The process parameters and tool travelling speed were determined for a defect-free weldment. The corrosion resistance of the joint was studied with electrochemical methods in 3.5 wt.% NaCl solution. A scanning Kelvin probe was used to detect localized changes at the metal and weldment surface. Samples were characterized to explore the metallurgical effects and the effect of process parameters on the microstructure during the welding deformation process. The primary α -Al phase formed during solidification can significantly limit the growth of the Cu_9Al_4 phase as observed by optical microscopy. With the increase in tool travel speed, α -Al precipitates in the CuAl matrix created during welding became coarser. The electrochemical results illustrate that the tool travelling speed of 40 mm/min produced the greatest corrosion resistant property.

Keywords: Friction Stir-Welding; Scanning kelvin probe; Aluminum-Copper; Corrosion; Polarization; Tool travel speed.

[FULL TEXT](#)

© 2019 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).