Data Article

On the effect of $\beta$ phase on the microstructure and mechanical properties of friction stir welded commercial brass alloys

Akbar Heidarzadeh*, Tohid Saeid

Faculty of Materials Engineering, Sahand University of Technology, Tabriz, Iran

ARTICLE INFO

Article history:
Received 7 October 2015
Received in revised form
20 October 2015
Accepted 8 November 2015
Available online 21 November 2015

Keywords:
Friction stir welding
Brass
Microstructure
Mechanical properties

ABSTRACT

Conventional fusion welding of brass (Cu–Zn) alloys has some difficulties such as evaporation of Zn, toxic behavior of Zn vapor, solidification cracking, distortion, and oxidation [1–3]. Fortunately, friction stir welding (FSW) has been proved to be a good candidate for joining the brass alloys, which can overcome the fusion welding short comes [4–7]. The data presented here relates to FSW of the single and double phase brass alloys. The data is the microstructure and mechanical properties of the base metals and joints. © 2015 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

Specifications Table

| Subject area | Materials Science and Engineering |
|-------------|----------------------------------|
| More specific subject area | Friction Stir Welding and Processing |
| Type of data | Table, images |
| How data was acquired | Table was acquired using the tensile test results. The images was captured using optical microscope (OM) and scanning electron microscope (SEM) |
| Data format | Analyzed |

DOI of original article: http://dx.doi.org/10.1016/j.msea.2015.10.012
* Corresponding author.
E-mail address: ak.hz62@gmail.com (A. Heidarzadeh).

http://dx.doi.org/10.1016/j.msea.2015.10.012
2352-3409/© 2015 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).
Experimental factors

The composition of the plates was 37 wt% Zn and 63 wt% Cu. The plates were annealed before welding at 50 °C for 1 h. For producing the double phase alloy, the plate was heated at 810 °C for 70 min, and then quenched in water at room temperature. A tool with a cylindrical shoulder (12 mm diameter) and a cylindrical pin (3 mm diameter and 1.7 mm length) made of H13 hot work tool steel was used. FSW was conducted at rotational speed of 450 rpm and traverse speed of 100 mm/min.

Experimental features

FSW was done parallel to the initial rolling direction of the plates. The tilt angle of the tool relative to the normal direction of the plate surfaces was kept constant at 2.5°. The joints were produced at room temperature.

Data source location

Sahand University of Technology, Tabriz, Iran

Data accessibility

Data is with this article

Value of the data

- The parameters presented here may help to obtain defect free friction stir welded joints of single and double phase brass alloys.
- Similar parameters can be used for friction stir welding of the other types of copper and brass alloys.
- Other researchers can use the presented data as a guideline in selecting the initial microstructure of the base materials to be friction stir welded.

1. Data

The tensile properties of the base materials and friction stir welded single and double phase alloys are presented here. In addition, the XRD pattern, OM and SEM images of the base materials and joints are the other part of the data.

2. Experimental design, materials, and methods

The single and double phase brass plates with dimensions of 100 mm × 100 mm × 2 mm were friction stir welded. After visual inspection, the microstructures of the joints were studied using optical microscope (OM) and scanning electron microscope (SEM) working with an accelerating voltage of 20 kV. The metallographic samples were cut from the joints, transverse to the welding direction, then polished and etched with a solution of 20 ml nitric acid and 10 ml acetic acid. The resulting microstructures are shown in Figs. 1 and 2. X-ray diffraction (XRD) was performed to

![Fig. 1. Microstructures of the base metals: (a) single phase brass, and (b) double phase brass.](image-url)
calculate the dislocation densities of the joints. The XRD patterns for the base materials and joints are presented in Fig. 3. In addition, the tensile test specimens were machined perpendicular to the welding direction with a gauge size of 12 mm (length) × 3 mm (width) × 2 mm (thickness). The tensile tests were conducted at a cross head speed of 1 mm/min. The tensile test data are presented in Table 1 in brief.

**Table 1**

| Tensile properties       | Single phase brass | Double phase brass |
|--------------------------|--------------------|--------------------|
|                          | Base metal | Joint  | Base metal | Joint  |
| Ultimate tensile strength (MPa) | 248       | 335    | 285        | 394    |
| Elongation (%)            | 68         | 47     | 52         | 38     |
Acknowledgments

The authors would like to thank Sahand University of Technology for its financial support for this study, which was done as a PhD thesis entitled "Microstructural evolution during friction stir welding of copper and commercial brass alloys".

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2015.11.013.

References

[1] G. Çam, Int. Mater. Rev. 56 (2011) 1–48.
[2] H. Farrokhi, A. Heidarzadeh, T. Saeid, Sci. Technol. Weld. Join. 18 (2013) 697–702.
[3] A. Heidarzadeh, T. Saeid, Mater. Des. 52 (2013) 1077–1087.
[4] A. Heidarzadeh, M. Jabbari, M. Esmaily, Int. J. Adv. Manuf. Technol. 77 (2015) 1819–1829.
[5] A. Heidarzadeh, T. Saeid, H. Khodaverdizadeh, A. Mahmoudi, E. Nazari, Metall. Mater. Trans. B 44 (2013) 175–183.
[6] A. Heidarzadeh, T. Saeid, Mater. Sci. Eng. A 649 (2016) 349–358.
[7] A. Heidarzadeh, K. Kazemi-Choobi, H. Hanifian, P. Asadi, 3-Microstructural evolution, in: M.K.B. Givi, P. Asadi (Eds.), Advances in Friction-Stir Welding and Processing, Woodhead Publishing, 2014, pp. 65–140.