ISSN 2300-1674

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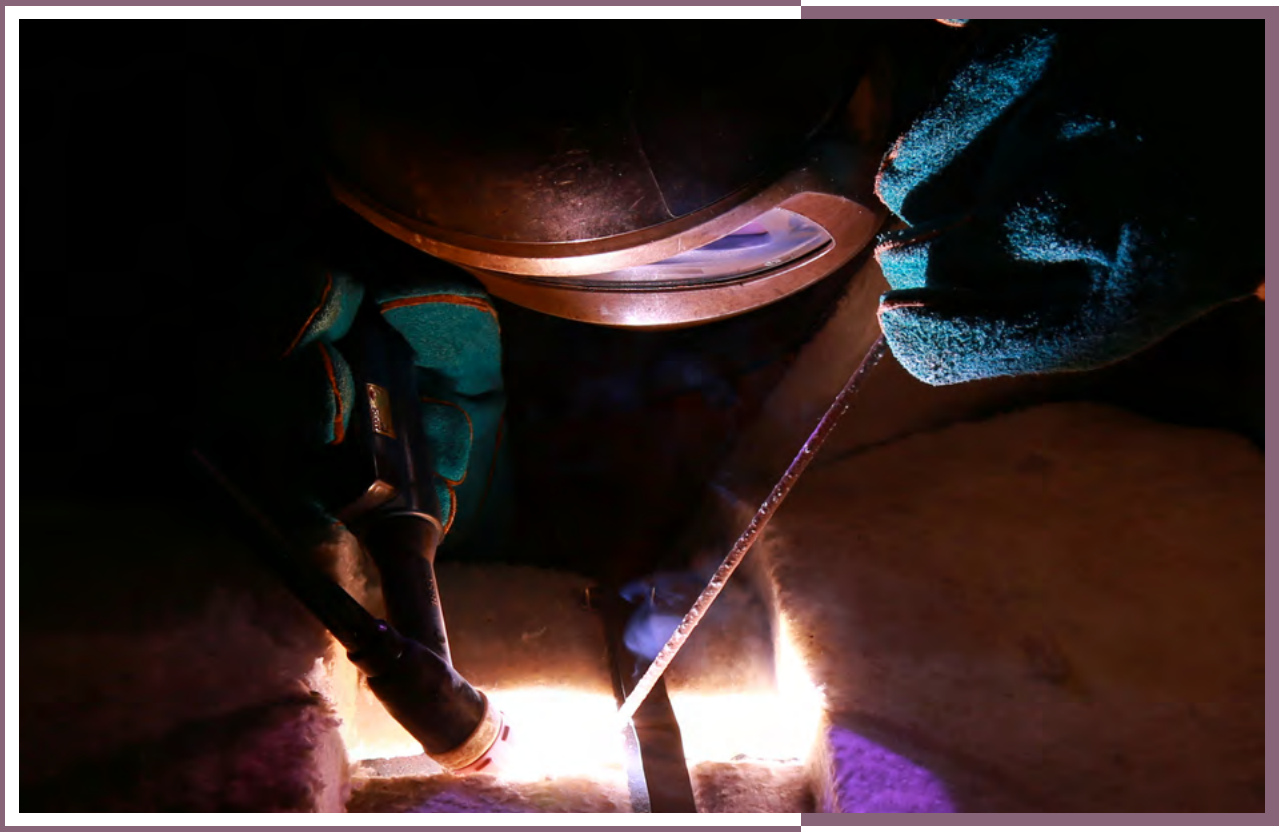

No. 2/2021

INSTITUTE OF WELDING BULLETIN

BIULETYN INSTYTUTU SPAWALNICTWA

No. 2 BIMONTHLY

CONTENTS

INSTITUTE OF WELDING

The International Institute of Welding and The European Federation for Welding, Joining and Cutting member

Summaries of the articles

Janusz Adamiec, Katarzyna Łyczkowska, Anna Dolata, Maciej Dyzia, Klaudia Zalewska, Paweł Kliś, Katarzyna Baluch, Joanna Bulik, Urszula Jakubiałowicz – Joinability of Centrifugal Composite Castings

DOI: *10.17729/ebis.2021.2/1*

Centrifugal composite castings based on aluminium alloys belong to a group of materials with high potential for application in the automotive and aerospace industries. Their use is limited by the lack of a technology enabling the obtainment of a permanent joint ensuring safe operation. The article presents the results of preliminary surfacing and welding tests of a hybrid centrifugal composite casting based on the AlSi12 alloy and reinforced with silicon carbide (5 % by weight) and glassy carbon (5 % by weight) particles. Structural tests and the quantitative evaluation of the distribution of structural constituents indicated the possibility of the joining of such composites using the TIG welding process. It was found that overlay welds made using the filler metal having a chemical composition similar to that of the matrix could be treated as a buffer layer. The aforesaid approach should enable the joining of composite castings. The structure of the weld revealed the presence of heterogeneously distributed reinforcing phases, which was related to the gradient structure of centrifugal composite castings. The presence of the Al_4C_3 phase at the interface between the glassy carbon and the matrix could result in the reduction of corrosion resistance in a humid environment. The structural tests discussed in the article should be supplemented with the assessment of the mechanical properties of the joint. As a result, it will be possible to implement the technology for the welding of composite castings on an industrial scale.

Leonid M. Lobanov, Nikolaj A. Pashchin, Igor P. Kondratenko, Yuriy M. Sidorenko, Pawel R. Ustimenko – Electrodynamic Treatment of Structural Elements Made of Aluminium and Magnesium Alloys

DOI: *10.17729/ebis.2021.2/2*

The article discusses the electrodynamic treatment (EDT) of thin-walled welded structures and EDT equipment, presents results of mathematical modelling concerning the effect of EDT on stresses in welded sheets made of aluminium alloy AMg6 as well as discusses the effect of EDT on the plastic strain mechanism. In addition, the article presents tests results concerning the effect of EDT during the welding of ship structures made of AMg6 plates and discusses the role of EDT in bulge formation. In addition, the article discusses the application of EDT during the repair welding of aero-engine nacelles made of magnesium alloy ML10 and the effect of EDT on openings in an airplane wing stinger in relation to its service life.

Łukasz Rawicki – Unconventional Methods of Non-Destructive Tests. Part 2

DOI: *10.17729/ebis.2021.2/3*

Non-destructive tests (NDTs) utilise various physical phenomena occurring inside or on the surface of objects subjected to testing. These types of tests do not break continuity or trigger changes in the structure of materials. Non-destructive tests also utilise electromagnetic properties of materials. The article presents methods which, as a result of the effect of electromagnetic field, magnetic field and electromagnetic radiation can be used successfully in industrial applications (e.g. magnetic flux leakage method and potential method).

Antoni Sawicki – Selected Properties of High-Frequency Initiators and Stabilisers of Electric Arc. Part 1. Devices with Free Electric Arc

DOI: *10.17729/ebis.2021.2/4*

The article presents selected physical properties of electric arc used in welding engineering as well as discusses differences in requirements concerning ionisers used to initiate and re-initiate electric arc. In addition, the article compares properties of ioniser systems used to stabilise electric arc burning as well as discusses spark gap and semiconductor systems generating high-frequency and high-voltage impulses used to generate spark discharges. The article also discusses the effect of ioniser operation after the modification of static current-voltage characteristics, enabling the modelling of dynamic states of electric arc.

Krzysztof Kwieciński, Piotr Śliwiński – Electron Beam Brazing of Austenitic Stainless Steel AISI 304

DOI: *10.17729/ebis.2021.2/5*

Electron beam brazing is a joining technology combining the advantages of a precisely controlled heat source and those of vacuum brazing process. The oxide layer decomposes in high-temperature vacuum conditions, which improves the wetting process and, consequently, leads to the obtainment of more favourable properties of the brazed joint. In comparison with brazing in vacuum furnaces, the electron beam brazing process enables the precise heating of selected areas without the necessity of heating the entire element, which, in turn, results in smaller structural changes in the brazed material and the lower consumption of energy. During tests discussed in this article, sheets made of stainless steel AISI 304 were brazed using various copper and silver filler metals. Brazed joints were subjected to microstructural tests and shear strength tests. The results revealed the high efficiency of the electron beam brazing of corrosion-resistant steel sheets using filler metals.

Biuletyn Instytutu Spawalnictwa

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Publisher:

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