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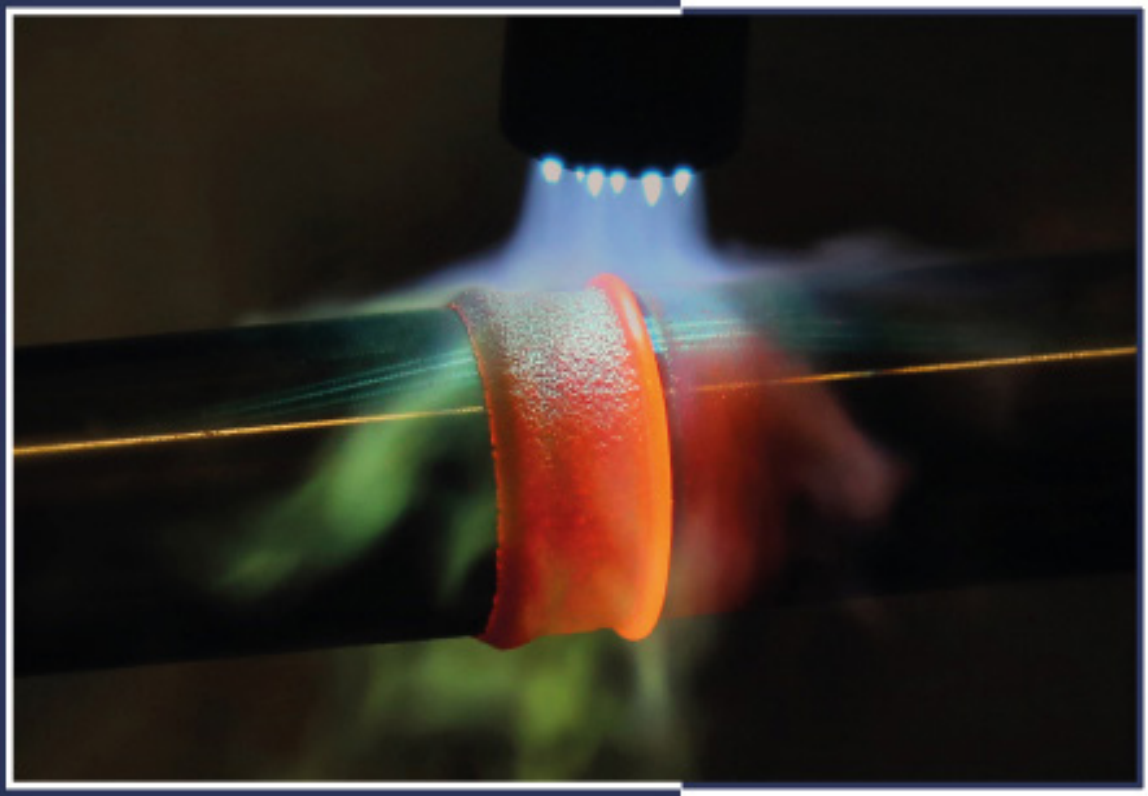

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CONTENTS

ŁUKASIEWICZ – UPPER SILESIAN INSTITUTE OF TECHNOLOGY
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The International Institute of Welding
and The European Federation for Welding,
Joining and Cutting member

Summaries of the articles

Katarzyna Hyc-Dadak, Damian Sobków, Jacek Pawlicki, Krzysztof Filipowicz, Michał Kawiak:

Mechanical and Plastic Properties of Elements Made of Steel X5CrNiCuNb16-4 Using the Selective Laser Melting Technique (SLM)

DOI: 10.17729/ebis.2023.4/1

The article presents results of tests performed using an MCP HEK Realizer II system applied in the selective laser melting (SLM) of metallic powders. Specimens subjected to the SLM process were made of powder, the chemical composition of which corresponded to that of solid steel X5CrNiCuNb16-4. The material was subjected to mechanical tests (concerning tensile and impact strength) and compared with the properties of the solid steel. The research-related tests also involved microstructural observations involving the use of a Neophot 32 metallographic microscope (Zeiss) and fractographic analysis. The tests revealed that the mechanical properties of the printed material subjected to the SLM process were lower ($R_{0.2}$ by 45% and R_m by 35%) than those of the solid material and were determined by the properties of the metallic matrix and the porosity of the printed element, the average value of which amounted to 3%. The mechanical properties of the printed material were also significantly affected by the direction of the external load in relation to the orientation of the deposited layers of the material (which was demonstrated during impact bend tests). The summary contains the assessment of the tests and the presentation of advantages resulting from the application of the new technology enabling the volumetric consolidation of metallic powder.
the results of the actual measurements, indicating that the assumptions and boundary conditions in the FEM modelling of the electron beam quenching process were defined correctly.

Sławomir Topór, Bernard Wyględacz, Santina Topolska:

The Effect of Welding Methods on Temperature Distribution in Steel Components with Composite Lining

DOI: 10.17729/ebis.2023.4/2

The paper presents the comparison of three welding processes, i.e. manual (i.e. hand-held) laser welding without the use of consumables (filler metals), manual laser welding involving the use of a solid wire as the filler metal and manual TIG welding with the solid wire used as the filler metal. Welding tests included measurements of temperature on the root side, i.e. 2 mm and 4 mm away from the weld axis, as well as the comparison of linear welding energy values. The measurement results enabled the identification of the most favourable solution applicable for the welding of steel materials with composite lining.

Grzegorz Michta, Aleksandra Wilk:

Laser-Welded Joints Made of Steels 304L and 904L Used in the Automotive Industry

DOI: 10.17729/ebis.2023.4/3

The article presents results of tests concerning welded joints made of alloy steels AISI 304L and AISI 904L using a high-power Nd:YAG laser. Tests involving the joints and aimed to identify their mechanical properties included tensile tests and microhardness measurements. The research work discussed in the article also involved the performance of microstructural tests of the base materials and welds as well as fractographic examinations.

Andrzej Dec, Antoni W. Orłowicz:

Automated Fabrication of Heat Exchangers Used in Process Vessels

DOI: 10.17729/ebis.2023.4/4

The article presents issues concerning the fabrication of coil heat exchangers on process vessels used in process lines of the food industry. Previously commonly fabricated shell tube exchangers, containing spot field welds, are susceptible to corrosion, the formation of sediments and implosion. In addition, such exchangers are sensitive to the high pressure of heating and cooling medium. The use of C-channel-shaped heat exchangers on the external surface of the vessel shell constitutes an innovative solution characterised by lower corrodibility and higher resistance to the pressure of medium and sediment formation. The research work discussed in the article concerns the above-presented solution and an automated station enabling the fabrication of innovative coil heat exchangers.

Małgorzata Witkowska, Joanna Kowalska:

Microstructure and Mechanical Properties of Plasma Arc Welded Joints Made of Austenitic Steel

DOI: 10.17729/ebis.2023.4/5

The tests discussed in the article aimed to analyse the microstructure and properties of plasma arc-welded joints (process 15) used in tests concerning welding procedure approval. The material subjected to the tests was austenitic steel X5CrNi18-10, belonging to a group of structural materials characterised by special properties (high corrosion resistance, favourable mechanical properties and good weldability). Because of its advantages, the steel is used in many industrial sectors and joined using various welding techniques. The article presents results obtained using the plasma arc welding process (PAW), which, due to its advantages, enjoys growing popularity in many industries. The test joints were subjected to macro and microscopic metallographic tests, mechanical tests (tensile tests, bend tests and hardness measurements) and diffraction tests.