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DIFFUSION WELDING OF HIGH-TEMPERATURE Ni-Cr ALLOY FOILS

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Producing joints of thin sheet foils from Ni-Cr based alloys by vacuum diffusion welding causes difficulties, because of presence of heat-resistant oxide film on their surfaces and low ductility of these materials. In this work weldability of 25 μm foils, made from Ni, Cr, Al powders was studied. A series of experiments for producing the joints was conducted to optimize the parameters of welding high-temperature Ni-Cr alloy. Welding temperature was varied in the range of 800 to 1200 ºC with 100 ºC increments. Compression pressure was Pw= 40 MPa in all the cases, soaking time in welding mode was tw = 20 min. It is established that joint zone defectiveness decreases with increase of welding temperature. However, a string of oxides located along the butt, remains in the joint zone even at welding temperature Tw = 1200 ºC.

Foils produced by the technology of electron beam evaporation and condensation in vacuum were used as interlayers to ensure plastic deformation in the butt and facilitate oxide film removal. By their structure the foils were multilayer elements, consisting of alternating layers of pure metals. Foils of Cu-Ti and Al-Ni systems of the total thickness of about 50 μm were used. Welding was conducted in the following mode: Tw = 1000 ºC, Pw = 30 MPa, tw = 30 min.

Microstructural analysis of joints produced with application of Cu/Ti interlayers shows that several diffusion zones of different composition form in the butt during welding. Element distribution graphs demonstrate that nickel diffusion into the butt runs more intensively than that of chromium.

In case of application of Al/Ni multilayer there are no defects in the butt joint. However, a certain chemical inhomogeneity is preserved that, apparently, is related to insufficient *development of diffusion processes. Application of additional annealing allows homogenizing element distribution in the joint zone.*

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Fedorchuk V.E., Shinkarenko V.S., Labur T.M., Gusarova I.A., Falchenko Iu.V. TECHNOLOGY OF HONEYCOMB CORE PREPARATION FOR WELDING THREE-LAYER ELEMENTS OF SATELLITE PROTECTION. VIII INTERNATIONAL CONFERENCE OF YOUNG SCIENTISTS **“WELDING AND RELATED TECHNOLOGIES”,** 20-22 may 2015. Vorzel, Kiev-2015. **PP 87**

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TECHNOLOGY OF HONEYCOMB CORE PREPARATION FOR WELDING THREE-LAYER ELEMENTS OF SATELLITE PROTECTION

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At present there is the need for development of qualitatively new technology of manufacturing heat insulation elements capable of withstanding high temperature gradients for thermal protection of space vehicles. Three layer structures with application of honeycomb core are the most promising ones, as they have minimum specific weight. The basic technology of manufacturing three-layer honeycomb structures is adhesion bonding that significantly narrows their service temperature range. Application of diffusion welding allows widening the operational capabilities for use of three-layer protection elements. When producing welded joints, however, higher requirements are made both to the quality of preparation of honeycomb core end faces, and to their flatness. Honeycomb end faces require precision machining. It is impossible to perform machining of honeycomb core in unrestrained state that is related to its high mobility. Honeycomb space has to be filled for fixation of honeycomb core partitions and imparting the required rigidity to them. This substance material should meet the following requirements: low melting temperature, sufficient rigidity, inertness relative to honeycomb core material, good grindability. We studied colophony, sulphur and paraffin as candidate materials for honeycomb core fixing.

Performed studies showed that colophony has the best machinability from the selected group of materials. Colophony was removed by heating after honeycomb core grinding. It should be also noted that colophony remnants are readily removed from the honeycomb core surface by washing in organic solvents.

Thus, technology of preparation of honeycomb core end faces has been developed, which ensures surface flatness for subsequent performance of welding operations.

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