BRAZING OF PACKED PIEZOPOWER ELEMENTS WITH AL-BASED BRAZING ALLOY STEMET®1502 [[1]](#footnote-1)\*)

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Currently, an urgent problem is the creation of efficient and reliable motion drives capable of operating under extreme operating conditions - elevated temperatures, high vacuum, etc. In this regard, research and development of a new type of actuators, including piezoelectric ones, is underway.

Piezoelectric elements are planned to be used, in particular, to drive the intravacuum components of the Thomson scattering diagnostics (TDR) of the international thermonuclear reactor ITER. The operating conditions of the DTR are characterized by high radiation loads and temperature during heating, vibration and significant overloads in case of possible emergency events [1]. Because of this, very stringent requirements are imposed on the joints of structural elements used in the reactor, including non-detachable ones.

In this work, we investigated the possibility of using high-temperature brazing of piezoelectric elements with a rapidly quenched aluminum-based brazing alloy. Columns were brazed from piezoceramic disks PKV-460 and TSVS-2

1 mm thick, with a copper coating of 3, 6, 9 µm and electrical leads made of copper foil 50 and 100 µm thick. Brazing was carried out with a brazing alloy STEMET®1502 with a thickness of 70 and 35 µm (Al–29,5Ge–3,9Si мас.%), Ts = 425 °C Tl =520 °C at a temperature of 600 ° C and an exposure of 10 minutes [2].

The positive characteristics of rapidly quenched brazing alloys are high chemical and phase homogeneity, achieved by quenching metal melts at rates of 104–106 K/s due to the fixation of a liquid-like amorphous structure in the solid state in the state of a supersaturated solid solution or the formation of a nanocrystalline structure.

By the method of EMF analysis on a scanning electron microscope Carl Zeiss EVO 50 XVP the microstructures of brazed joints were studied and maps of the distribution of chemical elements in the brazed seam were obtained.

The polarization mode for a piezo column of 5 disks has been worked out PKV-460, on columns of 5 and 10 disks TSVS-2, a mode taken from literary sources was tested.

The possibility of obtaining a mechanically strong joint from PKV-460 and TSVS-2 piezoceramics with copper plating and copper foil using STEMET®1502 brazing alloy is shown.

References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/E/ru/JH-Gurova.docx) [↑](#footnote-ref-1)