Investigation of the structure and functional properties of a rapidly quenched amorphous-crystalline TiNiCu shape memory alloy

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Amorphous-crystalline ribbons from the Ti50Ni25Cu25 alloy with a thickness of 28–30 m and a width of about 1.5 mm were obtained by the method of rapid-quenched from the melt. The resulting ribbons were subjected to electric-pulse processing with processing times of 1 ms, 10 ms, 100 ms, 1 s, and 5 s. Studies have shown that electric pulse treatment with a time of less than 1 s leads to a significant change in the emerging crystal structure compared to the structure obtained by standard isothermal treatment. The microstructure of such samples in cross section is characterized by an uneven distribution of crystals over the thickness of the ribbon: columnar crystals are observed on the contact and non-contact sides of the ribbon, while large crystals are present in the inner part of the ribbon. As the processing time decreases, regions are observed in the ribbon structure in which columnar crystals from the ribbon surfaces come into contact in the central part. In the obtained crystallized alloys, reversible martensitic transformations are observed in the temperature range of 55-75 C, as a result of which a pronounced shape memory effect is realized. This work is supported by grant No. 23-29-00779 from the Russian Science Foundation.