Features of crystallization of amorphous alloy Ti50Ni25Cu25 obtained by extreme methods

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The mechanisms and kinetics of crystallization in amorphous alloy of Ti50Ni25Cu25 produced by different methods of amorphization have been studied by x-ray diffraction at room temperature and in situ synchrotron diffraction upon heating up to 823 K. One of the amorphous states was obtained by melt quenching (MQ) at a cooling rate of 10^6 K/s. The other amorphous state was realized in a polycrystalline alloy of the same composition by high pressure torsion by four revolutions of the movable anvil (HPT4). Differential scanning calorimetry was used to determine the temperatures of crystallization and glass transition, as well as a change of the thermal effect as a function temperature. It is shown that the amorphous states under consideration substantially differ in the mechanisms and temperature parameters of crystallization. The amorphous phase produced by HPT4 was found to be less stable with respect to heating than the amorphous phase obtained by MQ. The origins of the difference in the crystallization kinetics of the amorphous phases obtained by MQ and HPT4 are discussed. The work was supported by the Russian Foundation for Basic Research (project No. 20-02-00291) and the Russian Science Foundation (project No. 19-72-20066, in situ research in synchrotron radiation).