GLASS-FORMING ABILITY AND CRYSTALLIZATION BEHAVIOR OF Al-Ni-Co-Nd (Sm) AMORPHOUS ALLOYS

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Amorphous ribbons based on aluminum with 3d-transition metals (PM) and rare-earth metals (REM) are actively studied due to their unique physical properties. They have a whole set of such properties: high corrosion resistance, ductility and strength. However, their low glass-forming ability limits their industrial application.

In present work, we investigated the effect of Nd and Sm on the glass-forming ability of Al-Ni-Co-REM alloys.

Amorphous ribbons were obtained from the alloys $Al_{86}Ni_4Co_4Nd(Sm)_6$ and $Al_{86}Ni_6Co_2Nd(Sm)_6$ by the spinning method.

X-ray diffraction studies has shown that the ribbons are completely amorphous. The kinetics of crystallization was studied by the DSC method in the Perkin Elmer device, and the electrical resistivity was measured by a standard four-probe method.

On the basis of the data obtained, the most popular criteria for the glass-forming ability are calculated, the temperatures of the thermal processes accompanying the crystallization process are determined, and the activation energy is calculated of the Kissinger method.

The studied tapes, in contrast to tapes obtained on the basis of ternary systems containing only Ni or Co, have a pronounced glass transition point, which is not typical for amorphous aluminum-based alloys. In addition, the replacement of 8 at.% Ni with 6 at.% Ni and 2 at.% Co increases the temperature of existence of the amorphous phase by almost 30 K, and a further increase in the cobalt content to 4 at.% At 80 K. The process of crystallization in the measurement of resistivity is accompanied by three phase transitions of the first kind.

Analysis of the results showed that the use of Nd and Sm in Al-Ni-Co-REM alloys is very promising from the point of view of increasing the region of existence of the amorphous phase.