ACTIVATION ENERGIES OF CRYSTALLIZATION IN AMORPHOUS $RMn_{4.5}Ge_{4.5}Fe_{1.5}Al_{1.5}$ (R = La, Y) ALLOYS

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The multicomponent $RMn_{6-x}Ge_{6-x}Fe_xAl_x$ ($0 \leq x \leq 6$) system with R=La,Y and Dy is derived from a ternary compounds combining transition metals (TM) Fe and Mn, rare-earths element (R), and metalloid or other metal (M) Ge and Al. Some compositions of this series with Dy were already obtained in fully amorphous state. Also for La and Y amorphization is attainable in the same range of compositions. Alloys with La and Y atoms will be used as nonmagnetic analogues for Dy in further heat capacity and resistivity measurements analysis. Here we report results obtained with x-ray diffraction (XRD) and differential scanning calorimetry (DSC). DSC curves were recorded at different constant heating rates from 10 to 50 K/min. Crystallization process in $LaMn_{4.5}Ge_{4.5}Fe_{1.5}Al_{1.5}$ sample occures in higher temperatures than in samples with Dy and Y and characterizes itself by the two well defined effects at the first exothermic event. Second peak is insignificant and not visible at some heating rates. This event is not taken into consideration but it has to be underlined that this effect is also observed for Dy and Y containing samples. Activation energies for primary crystallization were calculated from the Kissinger relation and thermal stability of $LaMn_{4.5}Ge_{4.5}Fe_{1.5}Al_{1.5}$ alloy reaches values of about 780 kJ/mol which exceeds considerably those for Dy and Y compositions.