DEVITRIFICATION BEHAVIOR AND STRUCTURAL EVOLUTION DURING HEATING OF FeSiBPMo ALLOYS

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Since their appearance the iron based amorphous alloys have been object of a remarkable scientific interest. Their main characteristics are their excellent soft magnetic properties, besides their high electrical resistance and good corrosion and mechanical resistance. These properties make them suitable for a variety of applications, such as cores for electrical transformers, electrical motors, anti-theft systems and magnetic sensors. A large number of iron-based alloys have been developed in order to improve and take advantage of the properties mentioned, the FeSiBPMo system is one of them, interesting for its good glass forming ability and good soft magnetic properties.

In this research the amorphous $Fe_{76}Si_{9-X}B_{10}P_5Mo_X$ (X=0, 2 and 5) alloy system in the shape of ribbons was obtained by the single roller melt spinning process, using a copper wheel in an argon atmosphere to avoid oxidation of the molten material. The study of the amorphous alloy started with the DSC analysis, which showed the thermal stability and revealed the crystallization peaks, useful for designing the annealing process. The heat treatment was carried out in the DSC at different temperatures to evaluate the effect of the annealing temperature on the structure and soft magnetic properties. XRD analysis confirmed the efficiency of the melt spinning process, showing a fully amorphous spectra on the as-spun ribbons. This technique also revealed the evolution of the material structure during the devitrification. It was found by VSM that the magnetic properties are affected considerably by the chemical composition and the phase evolution associated to the structural changes during the heating of the sample.