Properties of Nanocrystalline Alloys and Their Precursors after Electron Irradiation

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Abstract. Precursors of nanocrystalline $Fe_{78}Co_5Sn_5B_{12}$ and $Fe_{78}Co_5Sn_3P_2B_{12}$ alloys were irradiated by high energy electron beam with doses of 4 MGy. Effect of electron irradiation on the magnetic microstructure of nanocrystalline alloys prepared from irradiated precursors by their annealing (380ºC, 30 minutes, vacuum) was studied by Mössbauer spectroscopy. Analyzing the measured Mössbauer spectra we have followed the parameters like the direction of the net magnetic moment, intensity of the internal magnetic field and the volumetric fraction of the constituent amorphous and nanocrystalline phases. The direction of the net magnetic moment was the most sensitive parameter reflecting radiation damage and showed the tendency to turn to the ribbon plane after irradiation. Magnetic measurements performed on the studied alloys before and after irradiation also diclosed some changes of the microscopic magnetic parameters due to electron irradiation manifested on the shape of hysteresis loops. The results indicated that addition of phosphorus into the basic $Fe_{78}Co_5Sn_5B_{12}$ structure result in higher radiation resistance.