The effect of Zn, Ag and Au substitution for Cu in Finemet on the crystallization and magnetic properties

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Abstract: Soft magnetic ribbons of Finemet compound with Zn, Ag and Au substituted for Cu: $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_{1-x}M_x$ (M=Zn, Ag, Au; x=0.5, 1.0) have been fabricated by rapid quenching technique with wheel speeds of 10, 25 and 30 m/s, respectively. The crystallization evolution of samples examined by DSC measurements showed that the high cooling rates make the ribbons in amorphous state whereas the samples with M=Zn; x=0.5, 1.0 showed to be partly crystallized when they fabricated by the wheel speed of 10 m/s. In the case of Zn (x=0.5, 1.0) and Ag (x=1.0) substitution there is a sharp peak in the DSC curve corresponding to crystallization of ?-Fe(Si) phase. However, the role of Au is similar to that of Cu. Hysteresis loops of as-cast samples exhibited square form which relates to the pinning centers in domain wall displacement. After appropriate annealing, the ultrasoft magnetic properties of studied ribbons are obtained.

Author Keywords: Amorphous and glassy solid; Nanocrystalline materials; Soft magnetic amorphous system

Index Keywords: Amorphous materials; Copper; Crystallization; Gold; Magnetic hysteresis; Nanostructured materials; Quenching; Silver; Substitution reactions; Zinc; Amorphous and glassy solid; Hysteresis loops; Rapid quenching; Soft magnetic amorphous system; Magnetic materials

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