Fabrication of Soft Magnetic Fe-based Nanocrystalline Wide-Ribbons towards Industrial Application

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Success in development of nanocrystalline Fe-Si-B-P-Cu soft-magnetic alloys, NANOMET[1], has urged the materials to be used in industrial application. Fabrication of wide ribbons or atomized powder is, therefore, crucial for making prototype products, such as cores for transformers or motors. This paper reports the fabrication of wide ribbons having widths of 50 mm and 80 mm and a length of 70 m of a new NANOMET alloy by single-roll melt spinning technique. The as-quenched ribbons (25-μm thick) have amorphous structure and good outside appearance. The nanocrystalline ribbons, resulting from the optimum annealing, exhibit excellent soft-magnetic properties, i.e. low coercivity (Hc) of 7 A/m and high saturation magnetostriction (Bs) of 1.8 T. Low core-loss (W at 50 Hz) of 0.4-0.5 W/kg under maximum flux density of 1.5 T, which is much smaller than that of the commercially-used oriented/non-oriented Si-steels, regards the applicability of the alloys as magnetic core materials for electric power devices.

References:

[1] A. Makino, IEEE Trans. Magn., 48 (2012) 1331