Numerical Analysis of Magnetization Reversal in Glass-Covered CoSiB Microwires

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Abstract. Presented article deals with the onset of magnetization reversal in the soft ferromagnetic CoSiB microwires with a glass cover. Production method, a rapid quenching and drawing, induces a helical magnetic anisotropy in the CoSiB microwires with negative magnetostriction. When a gradually increasing longitudinal magnetic field is applied to CoSiB microwire the characteristic voltage pulses have been recorded in the pickup coil at magnetic field strength $H = \pm 2.5$ A/m. The first simple pulse shape was observed in case of low gradient of magnetising field. Further increase in magnetising field gradient causes more complex pulses shape. We have numerically calculated the magnetic flux changes connected with these three characteristic pulses. Results are analysed in frame of the model of cylindrical core-shell ferromagnetic domain structure, where the central area (core) of the microwire is longitudinally magnetized and the shell of the microwire is characterized by the helical magnetic anisotropy induced during the wire preparation. During magnetization reversal of the core, the irreversible movement of the single domain wall (Barkhausen jump) is detected, which is manifested by the simple pulse shape at $H = \pm 2.5$ A/m. Consequently, transition region (90°-domain wall) in which the vector of spontaneous magnetization must turn by an angle of 90° is affected and the complex pulses with sharp peak appear.

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