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HYSTERESIS OF NEEL LINE MOTION AND EFFECTIVE WIDTH OF 180° BLOCH WALLS IN BULK IRON

Subdivided 180° Bloch walls of alternating polarity have been observed on iron whiskers employing the interference-contrast colloid technique. The field-induced conversion of these complex walls is predominantly controlled by Néel-line motion. The static polarization curves, optically recorded for whiskers of various thicknesses, permit an experimental estimation of an effective Bloch-wall width which is in good agreement with the theoretically obtained value for bulk material.

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OBSERVATION OF SUBDIVIDED 180° BLOCH WALL CONFIGURATIONS ON IRON WHISKERS

Subdivided 180° Bloch walls have been observed on iron whiskers using an improved colloid technique. Under the influence of a magnetic field applied vertical to the surface of a specimen the magnetization reversal of the complex wall is governed by Néel line motion. The field-induced conversion exhibits a characteristic “remanence" and “coercivity" of the wall. During a longitudinal magnetization cycle of a whisker the actual wall configuration has a substantial influence on the magnetization curve. The coercivity of the specimen is closely correlated to the initial mobility of the Néel lines. Discontinuities in the Néel line motion are responsible for small Barkhausen jumps, especially in the low-field region. The irregular segmentation of the complex wall in the remanent state appears to be an essential source of the remanent whisker magnetization.

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INTERNAL STRUCTURE OF NEEL LINES IN SUBDIVIDED BLOCH WALLS

Three-dimensional configurations of Néel lines in subdivided 180° Bloch walls are derived by an analytic solution of the constitutive micromagnetic equations. The results provide the effective width and energy of the transition region. The energy depends upon the actual distance to the surface of the crystal and increases from a minimum surface value to a maximum bulk value.

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