9.7 cm

Switching of magnetostriction in rare earth Ising metamagnet induced by small sign-variable increments of a magnetic field.

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Experimental and theoretical studies of magnetostriction for Ising metamagnet $DyAlO_3$ were performed in the temperature range of $1.5 - 4.2$ K and magnetic fields up to 4 T. The magnetostriction curves measured during "field-up" and "field-down" magnetisation processes was found to be near-symmetric about the $H = 0$ axis and form a peculiar magnetostriction hysteresis loop. Besides, at any value of the magnetic field (ranging from very small to high fields) small sign-variable increments of the magnetic field result in reversible switching of magnetostriction between the "field-up" and "field-down" curves. Such a behaviour is similar to that of the magnetisation curves for "hard" type-II superconductors with strong pinning.

Possible mechanisms of these anomalies are proposed. A layered magnetic structure of the dipole Ising antiferromagnet $DyAlO_3$ and the existence of a great number of metastable magnetic phases which are near-equal in energy and break up the crystal into "quasi-mesoscopic" regions play a key role in the observed anomalies.

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