

Interpretation of the Antiferromagnetic Magnetostriction in CoO Single Crystals

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Interpretation of the Antiferromagnetic Magnetostriction in CoO Single Crystals*

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Abstract

The magnetization process in an antiferromagnet and its contribution to the magnetostriction are theoretically treated. In a domain, the rotation of the antiferromagnetic axis and the change in the mutual inclination between up- and down-spins from the antiparallel alignment cause a homogeneous magnetostriction through the whole domain. The domain wall displacement also gives a change to specimen length. They are all proportional to the square of the applied field strength. However, the anisotropy in the former as calculated (a function of the direction of applied field) is much different from the experimental results. The calculated value is less than 10^{-1} of the observed one. On the other hand, the calculated magnetostriction due to the latter shows satisfactory dependence on the applied field as well as on the direction of the magnetostriction: the sign and the magnitude are in good agreement with the experiment previously reported. It is concluded that the domain wall displacement plays the leading role in the magnetostriction of CoO single crystals.

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