SPONTANEOUS SURFACE MAGNETISATION OF MnF_2 SINGLE CRYSTAL IN THE ANTIFERROMAGNETICSTATE

V. I. Nizhankovskii[a], A. I. Khar'kovskii[a] and A. J. Zaleski[b]

[a]International Laboratory of High Magnetic Fields and Low Temperatures, Gajowicka 95 53-421 Wrocław, Poland

[b]Institute of Low Temperature and Structural Research, Polish Academy of Sciences, P.O. Box 937, 50-950 Wrocław, Poland

9.7 cm

Spontaneous magnetisation of (100) and (010) surfaces of MnF_2 single crystal in antiferromagnetic state is discovered. Its temperature dependence resembles that of a magnetic sublattice but the critical exponent of spontaneous magnetisation β_S is in the range $0.42 - 0.47$ that is significantly different from the critical exponent for the sublattice magnetisation $\beta = 0.31$ obtained by the magnetic x-ray scattering measurements. Sign of the surface magnetisation is determined by difference in dielectric constants ϵ of MnF_2 and ambient matter: magnetisation is always directed to the substance with smaller ϵ. Our explanation of above results is based on a simple microscopic model in which the influence of gradient of ϵ is reduced to the effective perturbation potential. The resulting decrease of the energy of the surface ions is compared with the energy of magnetic anisotropy. The lack of the spin-orbit interaction in the case of Mn^{2+} is favorable for the appearance of the surface magnetisation even for small gradients of the effective dielectric constant.

13.4 cm

Subject category :

2. Magnetic Films, Surfaces and Multilayers

Presentation mode :
poster

Corresponding author :
V. I. Nizhankovskii

Address for correspondence :
International Laboratory of High Magnetic Fields and Low Temperatures
53-421 Wroclaw, Gajowicka 95, Poland

Email address :
nizhan@alpha.mlspmint.pan.wroc.pl