

substance: NiO

property: magnetic properties

magnetic susceptibility (dependence on stress): Fig. 1.

$T > T_N$: Curie-Weiss law obeyed with $\Theta_p = -2000$ K [56S].

$T < T_N$: magnetic structure consists of ferromagnetic (111) planes antiferromagnetically coupled [58R1, 58R2, 60R]. The spins lie in the (111) planes along the $[\bar{1} \bar{1} 2]$ direction [67S].

Néel temperature

| | | |
|-----------|---------------------------|-----|
| T_N | 524.5 K | 67S |
| | 523(1) K | 73N |
| | 523.0 K | 78D |
| | 523.7 K | 74G |
| | 525 K | 73L |
| dT_N/dp | 1.58 K kbar ⁻¹ | 78D |

sublattice magnetization near T_N

| | | | | |
|-----|--------------------------------|-------------------|---------------------|-----|
| M | $\propto C/(T_N - T)^{2\beta}$ | $\beta = 0.35$ | for powders | 73N |
| | $\propto > C(1 - T/T_N)^\beta$ | $\beta = 0.37(3)$ | for single crystals | 78D |

spin-wave dispersion: shows an initial slope of 250 meV Å⁻¹ and a maximum energy of 117 meV; density of spin-wave states: Fig. 2.

parameters of spin wave Hamiltonian

$$H = \sum_j \sum_i J_{ij} s_i \cdot s_j + \sum_i D_1 S_i^x{}^2 + \sum_i D_2 S_i^y{}^2$$

($x \perp (111)$ plane, z along spin direction, D_1 represents out-of-plane anisotropy, D_2 in-plane anisotropy)

| | | | |
|---------------------------------------|------------|---|-----|
| J_1/k | + 16 K | $T = 78$ K | 71H |
| J_2/k | - 221 K | $T = 78$ K | 71H |
| | - 213 K | $T = 1.4$ K | 71D |
| | - 201 K | | 73S |
| | | mean value from powder susceptibility measurements 0...1200 K | |
| $\varepsilon_1 = d \ln J_1 / d \ln r$ | 27(5) | | 73S |
| | | $r =$ nearest neighbour distance | |
| D_1/k | 1.13 K | $T = 78$ K | 71H |
| D_2/k | 0.06 K | $T = 78$ K | 71H |
| J_1^+/k | + 15.7 K | $T = 78$ K | 72H |
| J_1^-/k | + 16.1 K | | |
| | | splitting into values for spin aligned parallel and antiparallel by the small rhombohedral distortion | |
| $(J_1^+ - J_1^-)/k$ | - 0.5(2) K | equal to $J_1 \varepsilon_1 \Delta$ with the trigonal distortion $\Delta = 1.3 \cdot 10^{-3}$ [71B] | 72B |

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Fig. 1.

NiO. Stress-annealed magnetic susceptibility vs. temperature measured parallel and perpendicular to the stress direction. The three symbols represent values found after annealing with stress along three different $\langle 111 \rangle$ directions [56S].

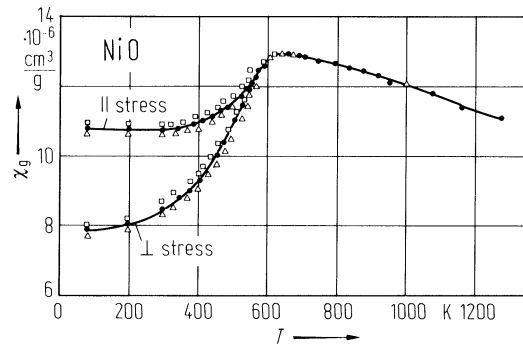


Fig. 2.

NiO. Density of spin-wave states vs. energy. Solid line is calculated best fit, dashed line is from $J_2/k = 221$ K alone [72H].

