

substance: Co₃O₄

property: magnetic properties

Co₃O₄ has antiferromagnetically coupled spins on the Co²⁺ tetrahedral sites at low temperature, with $T_N = 33.0(10)$ K [69K], 46 K [63B], 40 K [64R]. The basic magnetic structure at low temperatures is shown in Fig. 1. Moessbauer spectroscopy has suggested that the Co²⁺ spins actually cant away from the z -axis [69K]. The main spin coupling mechanism is apparently via the diamagnetic, low-spin Co³⁺. In the ordered magnetic state the magnetic moment on Co²⁺ sites is $p_A(A) = 3.26 \mu_B$ at 4.2 K. No moment is found on B-sites. At high temperatures, the magnetic susceptibility in the paramagnetic phase follows the Curie-Weiss law: $\chi = \alpha + C/(T - \Theta_p)$ (Fig. 2) [64R, 63B].

magnetic parameters

α	$0.74 \cdot 10^{-3} \text{ cm}^3 \text{ mol}^{-1}$	$T = 100 \dots 300 \text{ K}$		64R
	$0.71 \cdot 10^{-3} \text{ cm}^3 \text{ mol}^{-1}$	$T = 300 \dots 1000 \text{ K}$		58C
Θ_p	-53 K			64R
	-110 K			64P
p_{eff}	$4.14 \mu_B$	$T = 300 \dots 1000 \text{ K}$		58C
$p_A(A)$	$3.25 \mu_B$	$T = 100 \dots 300 \text{ K}$		64R
J_1/k	$-7.27(25) \text{ K}$	$T = 155 \text{ K}$	exchange coupling constant,	75S
			from neutron scattering	
	-5.3 K	$T = 100 \dots 300 \text{ K}$	from Curie-Weiss law	75S
	-4.0 K	$T = 100 \dots 300 \text{ K}$		64R
	-7.08 K	$T = 90 \dots 1200 \text{ K}$	from magnetic susceptibility data of [63B]	75S

References:

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- 64P Perthel, R., Jahn, H.: Phys. Status Solidi 5 (1964) 563.
- 64R Roth, W. L.: J. Phys. Chem. Solids 25 (1964) 1.
- 69K Kündig, W., Kobalt, M., Appel, H., Constabaris, C., Lundqvist, R. H.: J. Phys. Chem. Solids 30 (1969) 819.
- 75S Scheerlinck, D., Hauteder, S., Wegener, W.: Phys. Status Solidi (b) 68 (1975) 535.

Fig. 1.

Co_3O_4 . Magnetic structure at low temperatures [64R].

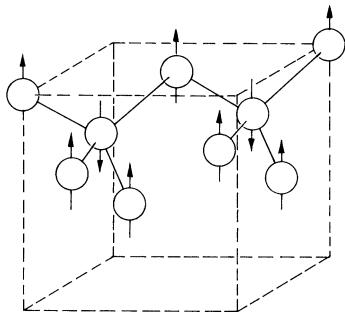


Fig. 2.

Co_3O_4 . Reciprocal paramagnetic susceptibility vs. temperature. Broken line: Curie-Weiss law using data listed in the tables [64R]. χ_m in CGS-emu.

