substance: Gd_2Cl_3
property: crystal structure, physical properties

Gd_2Cl_3 [91S]

structure: monoclinic, C2/m

lattice parameters

a	15.237 Å		structure: Fig. 1	79S
b	3.896 Å			
c	10.179 Å			
β	117.66°			

Néel temperature

T_N	26 K			85K

paramagnetic Curie temperature

Θ_p	–180 K			85K

magnetic moment

p_A	$7.7\mu_B$	per RE atom		85K

energy gap

E_g	0.85 eV			85K

temperature dependence of resistivity: Fig. 2
photoelectron spectrum: Fig. 3
density of states: Fig. 4
temperature dependence of susceptibility: Fig. 5
temperature dependence of C_p and C_m (C_p: specific heat, C_m: magn. part): Fig. 6

References:

79S Simon, A.: Struct. Bonding 36 (1979) 81.

82B Bauhofer, W., Simon, A.: Z. Naturforsch. A37 (1982) 568.

82E Ebbinghaus, G., Simon, A., Griffith, A.: Z. Naturforsch. A 37 (1982) 564.

85K Kremer, R.K.: Thesis (Darmstadt, Germany) 1985.

91S Simon, A., Mattausch, HJ., Miller, G.J., Bauhofer W., Kremer, R.K.: "Metal-Rich Halides" in: Handbook on the Physics and Chemistry of Rare Earths, Vol. 15, Gschneidner, K.A., Jr., Eyring, L. (eds.), Elsevier Science, 1991.

86M Miller, G.J., Burdett, J.K., Schwarz, C., Simon, A.: Inorg. Chem. 25 (1986) 4437.

Fig. 1.

Gd_2Cl_3. Projection of the structure along [010] [91S].

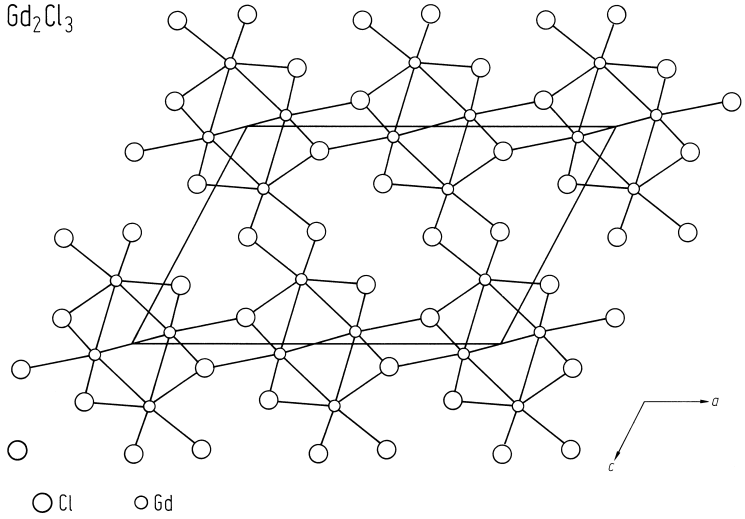

Fig. 2.

Tb_2Cl_3, Gd_2Cl_3. Resistivity as a function of temperature. The microwave measurements shown in the lower part were obtained on two different single crystals [82B].

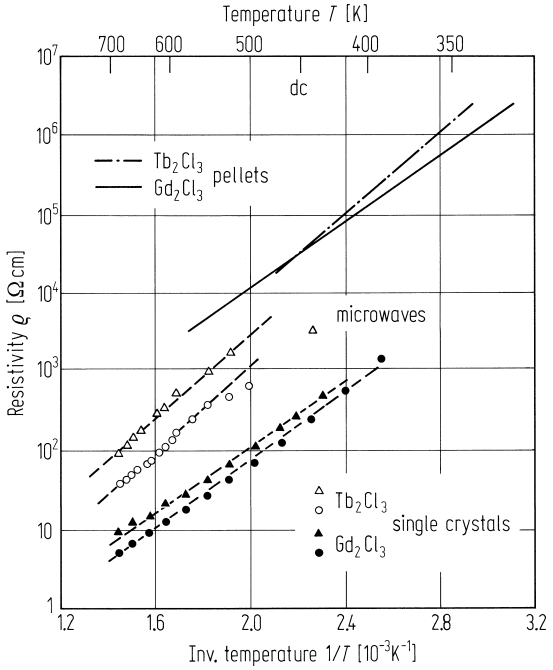

Fig. 3.

Gd, Gd_2Cl_3, $Gd_2Cl_2C_2$. Photoelectron spectra of Gd and Gd_2Cl_3 taken with He(II) radiation (40.8 eV, [82E]), and of $Gd_2Cl_2C_2$ (He(I), 21.2 eV, [86M]). The narrow f-band is marked; structures above the Fermi level (E_b = 0) in the spectra of Gd and Gd_2Cl_3 arise from excitations of electrons from the 4f band by the 50.3 eV satellite line.

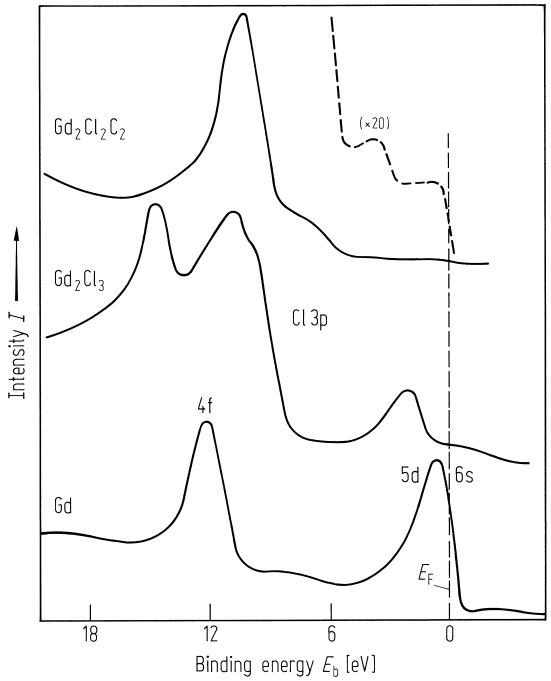

Fig. 4.

Gd_2Cl_3. Total DOS. The Fermi level is indicated by the dashed line; the peak between 10 and 9 eV contains three metal-metal bonding states for two formula units [91S].

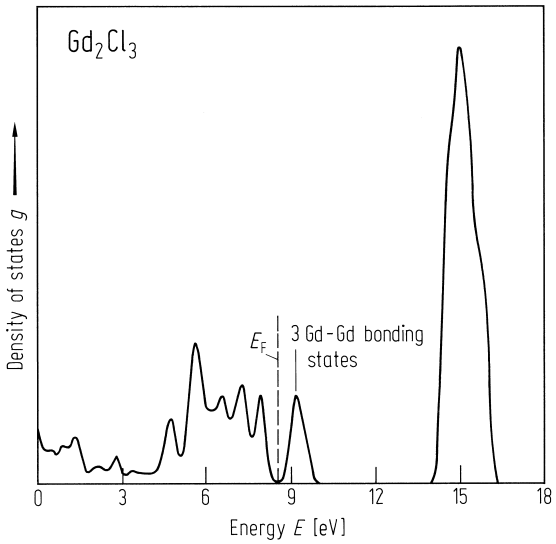

Fig. 5.

Gd_2Cl_3. Powder molar susceptibility (in CGS-emu) for different applied magnetic fields: 0.01, 0.03, 0.3, 1, and 5 T from top to bottom. The step in the range of 300 K originates from a spurious contamination of ferromagnetic Gd metal which is saturated with increasing magnetic field [85K].

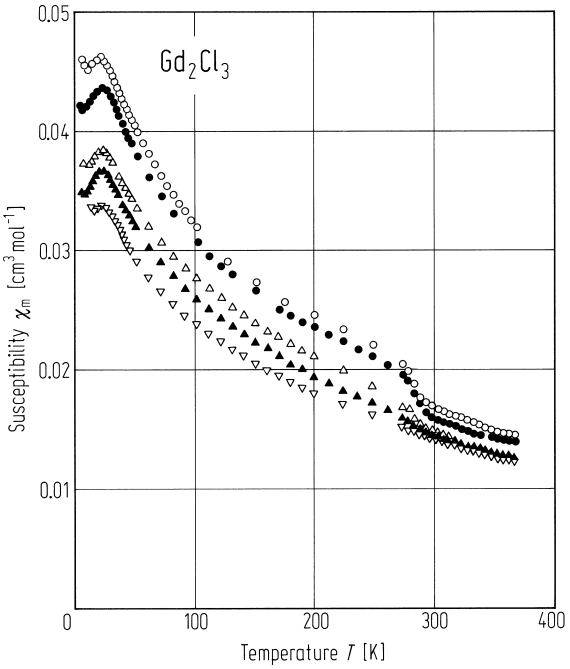

Fig. 6.

Gd_2Cl_3, Y_2Cl_3. **(a)** Specific heats vs. temperature. The arrow indicates the 3D ordering transition. **(b)** Magnetic part of the specific heat of Gd_2Cl_3 (per formula unit $GdCl_{1.5}$). The full line is the specific heat of an $S = 7/2$ Heisenberg chain with exchange constant $J/k = -2.6$ K [85K].