THE INFLUENCE OF THE MAGNETIC FIELD ON THE HEAT CAPACITY OF $CsGd(MoO_4)_2$[1])

ВЛИЯНИЕ МАГНИТНОГО ПОЛЯ НА ТЕПЛОЕМКОСТЬ $CsGd(MoO_4)_2$

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Cesium gadolinium dimolybdate is a layered crystal which undergoes a phase transition from the paramagnetic state into the complex magnetic state at $T_c = (0.448 \pm 0.004)$ K [1]. The anomalous heat capacity behaviour was found and described by the anisotropic square lattice Ising model solved in a new type of the correlated effective field approximation [2]. This comparison is based on the fact that the lowest energy doublet corresponds to $S = \pm 7/2$. To support this assumption the single crystal $CsGd(MoO_4)_2$ heat capacity measurements were performed from 1.5 K to 6 K in the

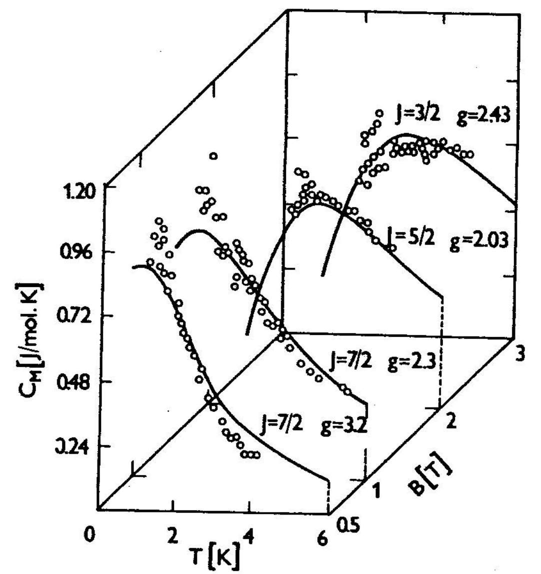

Fig. 1. Magnetic heat capacity of $CsGd(MoO_4)_2$. External magnetic field from 0.5 T to 3 T applied along direction *b*. (ooo — experimental data, ——— — theoretical curves for ideal paramagnet).

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magnetic fields up to 3 T. The heat capacity of a 1.9 g single crystal sample prepared by the flux method was measured by adiabatic calorimetry [3]. Temperature readings were obtained from the Allen Bradley carbon resistors ground into a thin plate shape with nominal values of 220 Ohm, 1/8 W and were corrected for magnetic field effects (at most 30 mK) if appropriate.

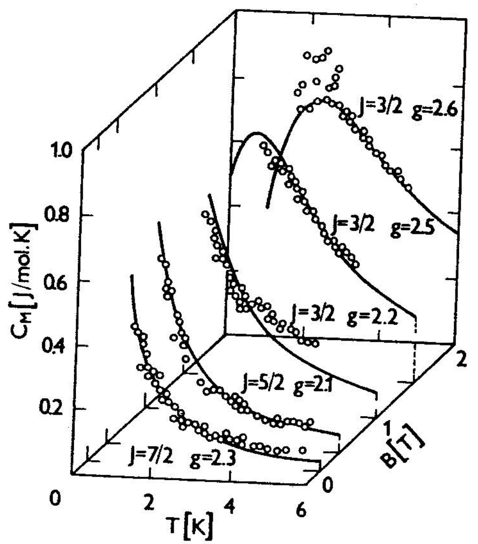

Fig. 2. Magnetic heat capacity of $CsGd(MoO_4)_2$. External magnetic field from 0.25 T to 2 T applied along direction *a*. (ooo — experimental data, ——— theoretical curves for ideal paramagnet).

The field dependent heat capacity for the field applied parallel to the *b* axis is shown in Fig. 1 and that for the field parallel to the *a* axis is shown in Fig. 2.

From the parameters *J* (*J* is equal to *S* for Gd^{3+}) in the theory for an ideal paramagnet giving a mathematically suitable fit of experimental data the single value was chosen so that the parameter *g* (the Landé factor) was closest to the value of 2. The heat capacity for an ideal paramagnet with such a *J* is represented for various magnetic fields by full curves on the plots. The results of the heat capacity in low fields are in a good agreement with the theoretical curves for $J = 7/2$; by an increase of the field the parameter *J* decreases to the value of 3/2 (Fig. 1, Fig. 2). The deviation of the *g*-factor from the value of 2 for a low field parallel to the *b* axis (Fig. 1) is probably caused by the exchange interaction (along the *b* axis Gd^{3+} ions form a chain-like structure [4]). The conclusion can be made now that the lowest energetic state corresponds to $S = 7/2$, which can be the reason of the magnetic anisotropy of the Gd^{3+} ions in $CsGd(MoO_4)_2$ in the vicinity of the phase transition.

The most notable feature of the figures is the exceptional noisiness of the data near the maximum and the absence of noise apart from the maximum. This noise is not the "apparatus effect". The dispersion of the experimental data is more than ten times larger than the accuracy of the measurements [3]. This noise was not observed in the heat capacity of the powdered samples [5]. We assume that the noise can be connected with magnetic domains rearangement in $CsGd(MoO_4)_2$.

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