# DETECTION OF TOROIDAL MOMENT IN $Cr_2O_3$ AT THE SPIN - FLOP PHASE

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9.7 cm

The magnetoelectric effect of $Cr_2O_3$ single crystals had been investigated in a strong magnetic field up to 250 kOe. We have detected the existence of toroidal spin ordering in $Cr_2O_3$ at the spin-flop phase, which is allowed by the symmetry of these crystals. This conclusion follows from the next experimental fact. The non-diagonal components of the magnetoelectric susceptibility tensor in $Cr_2O_3$ have antisymmetric part which is dual to the toroidal moment. The toroidal moment first was observed experimentally in $Ga_{2-x}Fe_xO_3$ crystals [1]. The toroidal moment in $Cr_2O_3$, in contrast to $GaFeO_3$, can be discovered only in the strong magnetic fields $H||c$ when the spins cant to the ac plane and the non-diagonal components of the magnetoelectric tensor arise. Components of the electrical polarization $P_a$ and $P_c$ were measured in the magnetic field oriented in the ac plane at angle $5^o$ to c-axis. Comparison of the experimental curves with theoretical ones showed that non-diagonal components of magnetoelectric tensor ($\alpha_{13}$, $\alpha_{31}$) differ in sign. The significant asymmetry of the components $\alpha_{13}$ and $\alpha_{31}$ confirms that toroidal ordering exists in $Cr_2O_3$.
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