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The Magnetic Properties of Cupric Formate Tetrahydrate at Low Temperatures

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Abstract

The magnetic susceptibility of single crystals of $\text{Cu}(\text{HCO}_2)_2 \cdot 4\text{H}_2\text{O}$ was measured at temperatures between 1.4°K and 80°K by a. c. bridge and magnetic balance method. This salt is an example of the magnetic two dimensional lattice. The interaction between Cu^{2+} ions is mainly the superexchange interaction through a formate ion in the same layer. From the Weiss constant of about -150°K , it is concluded that strength of superexchange interaction through a formate molecule, $-(\text{O}-\text{CH}-\text{O})-$, has the same order as that through one diamagnetic atomic ion such as $-(\text{Cl})-$. The existence of a broad maximum of the susceptibility at about 60°K implies the appearance of short range order in the two dimensional lattice. The antiferromagnetic transition accompanied by parasitic ferromagnetism was found at $17.0^\circ\text{K} \pm 0.2^\circ\text{K}$. The weak ferromagnetic moment in L_1L_2 plane was about 150 c. g. s. e. m. u. at 0°K . Along L_3 axis, no ferromagnetic moment was found. The susceptibility of isomorphous $\text{Cu}(\text{HCO}_2)_2 \cdot 2\text{H}_2\text{O} \cdot 2(\text{NH}_2)_2\text{CO}$ was similar to that of $\text{Cu}(\text{HCO}_2)_2 \cdot 4\text{H}_2\text{O}$.

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