EPR STUDIES ON A WEAKLY MAGNETICALLY COUPLED COPPER(II) SYSTEM $[Cu(en)_2I]_2[Cu(en)_2\{CdI_4\}_2]$

A. Ozarowski (NHMFL); V. Kokozay (Kiev U., Chemistry)

Introduction

The complex consists of two types of building blocks: $[Cu(en)_2I]+$ and $[Cu(en)_2\{CdI_4\}_2]^{2-}$ which are linked together by H-bonds. Block $[Cu(en)_2\{CdI_4\}_2]^{2-}$, consists of units $[Cu(en)_2]_2+$ and $[CdI_4]^{2-}$, conjoined together through the bridging iodine atoms (en=ethylenediamine). There are two crystallographically independent copper ions in the complex. The Cu(1) (from $[Cu(en)_2I]+$) is square pyramidal, while Cu(2) (from $[Cu(en)_2\{CdI_4\}_2]^{2-}$) has distorted octahedral environment.

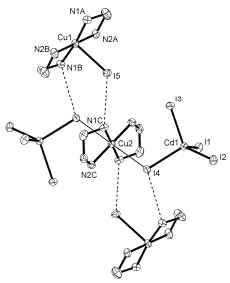

Fig. 1. Structure of the title compound.

Experimental

The measurements performed on the 15/17 Tesla homodyne instrument at the frequencies between 95 and 380 GHz at temperatures over the range 3-300 K.

Results and Discussion

The temperature dependence of the magnetic susceptibility indicates that the magnetic coupling between copper ions is very weak. In EPR, three signals were observed whose effective g values did not change with frequency or temperature, at g_1=2.04, g_2=2.10, g_3=2.13 (Fig. 2) and they must be attributed to the ground state with S=1/2 in the system. Fine structure was observed at low temperatures and very high frequencies.

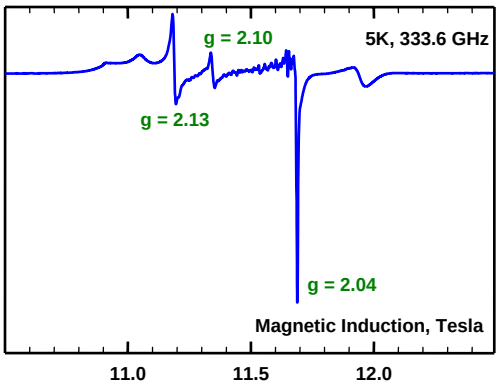

Fig. 2. High-frequency EPR spectrum of the title compound (5K, 333.6 GHz).

Conclusions

Values of the g components indicate that the exchange interactions are not limited to the trinuclear unit in Fig. 1, but rather extend over the crystal lattice through the weakly bonding iodine bridges. The origin of the fine splitting is not understood yet. It may come from the zero-field splitting within a state with S>1/2, or from the transitions between states differing in the quantum number S. Such transitions are allowed in coupled systems of non-equivalent copper ions. The work on interpretation of the EPR spectra is in progress.

Acknowledgements

This work was supported by the INTAS (project 03-51-4532) and by NHMFL (project 7300-059). NHMFL is funded by the NSF through Grant DMR-0084173 and the state of Florida.