Magnetic properties of $(NH_3OH)_2MF_4$ (M = Cu, Co) layered fluoro-metal complexes

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INDRODUCTION AND MOTIVATION

Layered fluoro-metal complexes have recently attracted attention due to their structural similarity to layered copper oxides, like e.g. La_2CuO_4, which is important precursor of the high-T_c oxocuprate superconductors. [1]

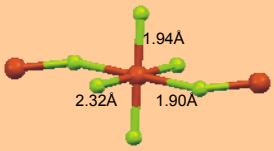
We synthesised two new isostructural layered fluoro-metal complexec and investigated their magnetic properties.

SAMPLE PREPARATION AND STRUCTURE

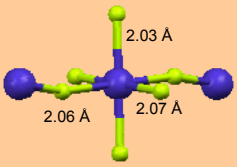
The compounds $(NH_3OH)_2CuF_4$ (**Cu-complex**) and $(NH_3OH)_2CoF_4$ (**Co-complex**) were prepared by the reaction of solid NH_3OHF and the aqueous solution of copper or cobalt in HF. Both compounds crystallize monoclinic, *P*21/*c*, with cell parameters [2]:

a = 7.9617(2) Å, *b* = 5.9527(2) Å, *c* = 5.8060(2) Å, β = 95.226(2)0 for **Cu-complex** and

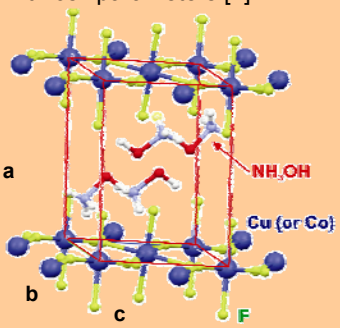
a = 8.1764(3) Å, *b* = 5.8571(2) Å, *c* = 5.6662(2) Å, β = 94.675(3)0 for **Co-complex**.



Cu-complex: Cu-F distances; distorted octahedra



Co-complex: Co-F distances; less distorted octahedra

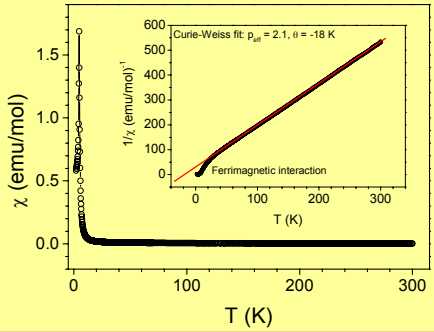


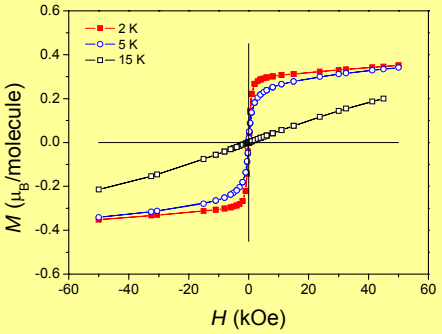
Layered structure

MAGNETIC PROPERTIES

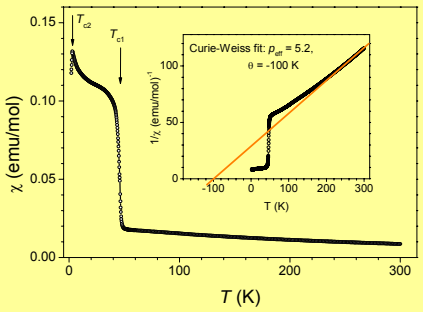
Cu-complex

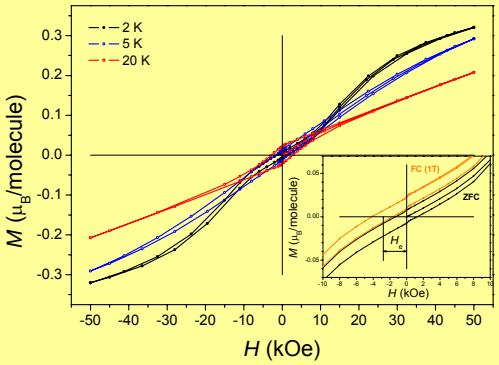
Effective Bohr magneton number p_{eff} = 2.1 is in the range expected for Cu^{2+}, S=1/2 ion.
Phase transition from paramagnetic to ferrimagnetic state at 18 K.

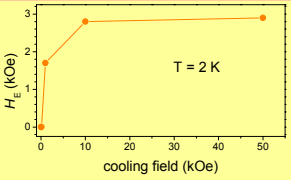


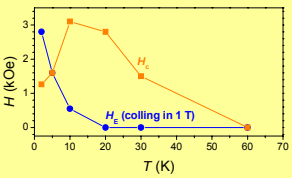


Co-complex









Effective Bohr magneton number p_{eff} =5.2 is in the range expected for Co^{2+}, S=3/2 ion.
Two phase transitions: at T_{c1} = 46.5 K a FM interaction, below T_{c2} = 3 K a ferrimagnetic order.

Exchange bias and temperature dependence of coercivity.

LITERATURE

[1] Grochala W, Nature Mater 5(7): 513-514 (2006)

[2] Kristl et al., *Hydroxylammonium fluorometalates: Synthesis and Characterisation of a new Fluorocuprate and Fluorocobaltate*, send to European J. of Inorg. Chem.

CONCLUSIONS

Ferrimagnetic order at 2 K in both compounds.

First detection of exchange bias in fluoro-metal complex (only in Co-complex).