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A Dimeric Copper Complex with Phthalic Acid and 2,2′-Bipyridine

Short Communication

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A preliminary X-ray single crystal analysis shows that [Cu(phthalate)(2,2′-bipyridine)] · 2 H_2O is dimeric in structure, which is usually not encountered in Cu-phthalate complexes.

(Keywords: 2,2′-Bipyridine; Crystal structure; Copper complexes, Phthalic acid)

Ein dimerer Kupferkomplex mit Phthalsäure und 2,2′-Bipyridyl (Kurze Mitteilung)

Eine vorläufige Röntgen-Einkristallanalyse zeigt, daß [Cu(Phthalat)(2,2′-Bipyridyl)] · 2 H_2O dimer vorliegt, was bei Cu-Phthalatkomplexen gewöhnlich nicht der Fall ist.

Copper(II) complexes with the phthalate ion, $C_8H_4O_2^{2-}$ (*pht*), have recently been of considerable structural interest[1—11]. It has been found that almost in all cases the *pht* exhibits a polydentate function, behaving as a bi-[8,11], tri-[2,3,5,6,9,10], or even as a tetradentate[4,7] ligand. As a consequence, almost all known Cu-*pht* complexes are chain- or layer-type polymers in which the *pht* group bridges the Cu atoms. There has been only one known example[8], Ba[Cu(*pht*)$_2$(H_2O)$_2$], where *pht* does not have the bridging role; in this case the solid contains discrete [Cu(*pht*)$_2$(H_2O)$_2$]$^{2-}$ moieties (but even there the complex anions are mutually connected through hydrogen bonds).

We report here, on the basis of a preliminary X-ray single crystal analysis, that the compound [Cu(*pht*)(*bipy*)] $\cdot 2H_2O$ (*bipy* = *2,2'*-bipyridine) differs markedly in structure from all known Cu-*pht* complexes, since it consists of discrete dimeric molecules (Fig. 1). The complex, obtained by slowly evaporating an equimolar solution of $Cu(NO_3)_2$, *bipy*, and Na_2(*pht*) ($c_M = 0.005$ mol/dm^3), has the following unit cell parameters: space group, $P2_1/n$; $a = 1.5685(11)$, $b = 1.2900(9)$, $c = 0.8825(3)$ nm, $\beta = 100.45(3)°$; $Z = 4$; $\rho_c = 1.56$ g/cm^3. Fig. 1 shows the main features of the dimeric structure. The coordination polyhedron around each Cu atom has a square pyramidal geometry and the dimeric structure arises from Cu—O interactions within pairs of [Cu(*pht*)(*bipy*)] units: the Cu atom in one unit is bound to a phthalate O atom of another unit. The apical Cu—O bond (0.258 nm) is about 1.4 times longer than the basal Cu-ligand distances (the latter have an average value of 0.189 nm), as expected for Cu(II) complexes due to the *Jahn-Teller* effect. A similar dimeric-type structure has recently been reported for [Cu(phenylpropionate)$(H_2O)_2$(1,10-phenanthroline)] NO_3[12].

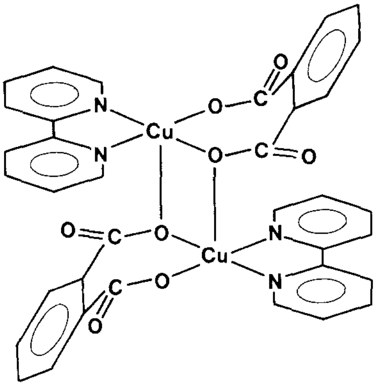

Fig. 1. Schematic drawing showing the dimeric structure of the [Cu(*bipy*)(*pht*)] $\cdot 2H_2O$ complex (hydrogen atoms and water of the lattice not included)

It is remarkable that the related [Cu(*pht*)(*phen*)] complex (*phen* = 1,10-phenanthroline) has the usual polymeric structure[11] with the *pht* bridges. Similar structural differences between analogous Cu-*bipy* and Cu-*phen* complexes have been observed in the $[Cu(H_2PO_2)_2(L)]$ system (L = *bipy* or *phen*)[13, 14], and have been attributed to differences in bulkiness and rigidity between the *bipy* and *phen* ligands.

The refinement of the structural analysis is currently in progress.

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