

## STRUCTURAL AND MEOSGENIC PROPERTIES OF GOLD(I) THIOLATE AND ISOCYANIDE COMPLEXES

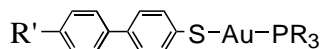
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It is well-known that weak ground-state interactions between  $d^{10}$  gold(I) centers influence the molecular structure in the solid state. Close contacts between Au(I) atoms in the vicinity of the van der Waals separation are prevalent in X-ray crystallographic studies of gold(I) complexes. There are also examples where Au(I)-Au(I) interactions influence the course of a reaction in solution [1]. Gold-sulfur and gold-isocyanide complexes are of special interest because soft ligands promote gold-gold interactions [2]. We are currently exploring the ability of Au(I)-Au(I) interactions to influence the formation of mesophases [3]. We have synthesized the series of neutral gold(I)-thiolate complexes shown below and have examined their thermotropic mesogenic properties by using polarized optical microscopy.



**Figure 1.** Gold(I)-thiolates: R' = H,  $\text{OC}_n\text{H}_{2n+1}$  ( $n = 1, 8, 12, 14$ ); R =  $\text{CH}_3$ ,  $\text{C}_6\text{H}_5$ .

The melting points decrease as the alkoxy chain length increases. The gold-thiolate complexes with  $n > 1$  show interesting mesogenic behavior upon melting, but they also show irreversible decomposition after formation of the isotropic phase. An X-ray crystal structure of the trimethylphosphine gold(I) complex with  $n = 8$  has been obtained showing three different types of intermolecular interactions: between gold atoms, between long chain aliphatic regions and between aromatic rings.

We have also begun exploring the liquid crystalline properties of a series of neutral cyclohexylisocyanogold(I) halide complexes. The chloro derivative,  $\text{CyNCAuCl}$ , exhibits intriguing photophysical properties [4]. Two forms of the compound give essentially identical characterization results but they exhibit drastically different luminescence properties. One form, isolated as single crystals, has a structure consisting of anti-parallel zig-zag chains with alternating short ( $3.39\text{\AA}$ ) and long ( $3.59\text{\AA}$ )  $\text{Au}\cdots\text{Au}$  intermolecular distances. Crystals of this form give orange luminescence while microcrystalline samples give a turquoise blue-green emission. Fluid and rigid solutions of either form of the compound give interesting luminescence behavior, the color of which can be controlled by temperature, excitation wavelength, concentration, and decay time. To help distinguish the two forms, a study of the propensity to form liquid crystals

has been initiated. Results obtained to date suggest that the microcrystalline sample indeed forms a liquid crystalline phase at approximately 130° C. This is particularly interesting since the complex does not contain organic ligands that are typical for promoting mesophases. Polarized optical microscopy and DSC experimental results for the microcrystalline and single crystals will be presented.

#### References

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