Soft ligands for the design of d-metals complexes with liquid crystalline properties

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Thiourea-based derivatives are extensively used for the development of new structures with great applications in various fields ranging from biological aspects to catalysis, nanotechnology, anion recognition or ion transport. On the other hand, the thiourea-based "soft" ligands are less employed in the design of liquid crystals (LC) or metal complexes with liquid crystalline properties, in the latter case in spite of their excellent coordination abilities, mainly due to the restriction of the molecular architecture of the resulting complexes. For example, even if the Cu(I) is an attractive target for such compounds, the design and the preparation of Cu(I) metallomesogens is a highly demanding task. Such complexes can have poor stability in solution (various polymeric compounds can be obtained) besides the isolation of different products with coordination geometries around the metal center that disfavors the stabilization of an LC phase (tetrahedral or plan-trigonal). Yet, the interplay between the particular hydrogen bonding of the thiourea derivatives and the steric constraints in the LC phase could be successfully balanced for the generation of new appealing LC materials with emission properties.

Several molecular architectures derived from homo- or heteroleptic complexes based on *N*-acyl thiourea and various metal ions: Cu(I), Pt(II), Pd(II) as well as their impact on the mesogenic behahior will be discussed here. Novel neutral copper (I) metallomesogens, based on thiourea derivatives, which are able to combine the liquid crystalline properties with their excellent room-temperature emissive properties will be presented. Mononuclear Cu(I) complexes with lower transition temperatures and rich mesomorphic behavior, both calamitic and discotic materials, can be designed by playing with the number and length of the alkoxy terminal groups. Moreover, complexes having the N-acyl thiourea ligands bound to the Ptppy fragment (ppy=2-phenylpyridine) display stimuli-dependent emission as well as liquid crystalline properties (SmA).