In Search of Chiral Molecular (Super)Conductors

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Introduction of chirality into molecular precursors is a topic of much current interest as it allows the preparation of multifunctional materials in which the chirality may influence, for example, the conducting properties [1]. One of the strategies we have been developing over the last years consists in using chiral methylated BEDT-TTF and EDT-TTF derivatives in crystalline radical cation salts with diverse anions [2,3], which allowed us, for example, to observe the electrical magnetochiral anisotropy effect (eMChA) for the first time in a TTF based conductor [4]. The influence of the number of stereogenic centers and that of the steric hindrance on the conducting properties have been addressed through radical cation salts of the monoalkylated donors R-EDT-TTF (R = Me, Et) [5]. On the other hand, the relationship between chirality and superconductivity is an intriguing question. The two enantiomeric crystalline radical cation salts κ-[(*S*,*S*)-DM-BEDT-TTF]$_2$ClO$_4$ and κ-[(*R*,*R*)-DM-BEDT-TTF]$_2$ClO$_4$, showing κ-type arrangement of the organic layers, were investigated in search for superconducting chiral molecular materials [6].
The second family of chiral conducting materials we have been investigating since several years is the one of the metal dithiolene complexes [7]. We have recently addressed the introduction of chirality into such complexes through the use of the dimethyl-dddt ligand, which allowed the preparation of Ni(II) and Au(III) bis(dithiolene) complexes [8,9].

References

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