Institut des Sciences Moléculaires BORDEAUX

Monthly Conference Series

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10:30 Invited speaker

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Chirality Related Properties in Helicene and Tetrathiafulvalene based Materials

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] which allowed us, for example, to observe the electrical magnetochiral anisotropy effect (eMChA) for the first time in a TTF based conductor.[3] Moreover, 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.[4]

Another chirality related effect is the chirality induced spin selectivity (CISS) consisting in a preferential spin transmission through a chiral material. In this respect, thiadiazole-helicenes have been used to boost the oxygen evolution reaction (OER) by up to ca. 130 % (at the potential of 1.65 V vs. RHE) of state-of-the-art 2D Ni- and NiFe-based catalysts *via* the CISS effect.[5] Our results show that the chirality of the helicene molecules is accountable for a great enhancement in the activity of state-of-the-art OER catalysts. The enhancement is related to the electron spin polarization at the catalyst surface. In this contribution we will discuss as well evidences for the occurrence of the CISS effect in chiral tetrathiafulvalenes.

[1] F. Pop et al., *Chem. Rev.* **2019**, *119*, 8435–8478.
[2] N. Mroweh et al., *Chem. Sci.* **2020**, *11*, 10078–10091.
[3] F. Pop et al., *Nat. Commun.* **2014**, *5*, 3757.
[4] N. Mroweh et al., *Adv. Mater.* **2020**, *32*, 2002811.
[5] Y. Liang et al., *Nat. Commun.* **2022**, *13*, 3356