DESIGN, SYNTHESIS AND APPLICATION OF HYBRID CHIRAL ORGANIC-INORGANIC MATERIALS

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Chiral compounds are ubiquitous in nature and chirality plays a crucial role in various natural processes because biological properties of individual enantiomers of a chiral compound may differ *in vivo*, despite their almost identical physico-chemical properties. Utilization of chiral compounds in materials chemistry gives rise to smart materials that can serve for various purposes, such as multifunctional dopants to liquid crystal matrixes and chiral sorbents for resolution of racemic mixtures. Recently, we have presented the first example of a multifunctional dopant, which upon mixing with an achiral liquid crystal gives rise to the photosensitive and magnetic nanocomposite exhibiting chiral mesophases (Fig. 1 - left).[1] Controlling chirality puts us in front of a challenge to separate the enantiomers prior using them, *e.g.*, as dopants or even pharmaceuticals. To address this need, we have developed several chiral stationary phases (Fig. 1 - right) that enable chiral resolution of various racemic mixtures using liquid chromatography.[2,3]
Recently, we have focused more on the explanation of the chiral recognition processes because of some unexpected findings.[4] This effort in shedding light on the mutual interactions of a selector and selectand is mostly based on *ab initio* calculations and molecular dynamics simulations.[5] During the seminar, I will present our recent findings and discuss their potential for future research as well as industrial applications.

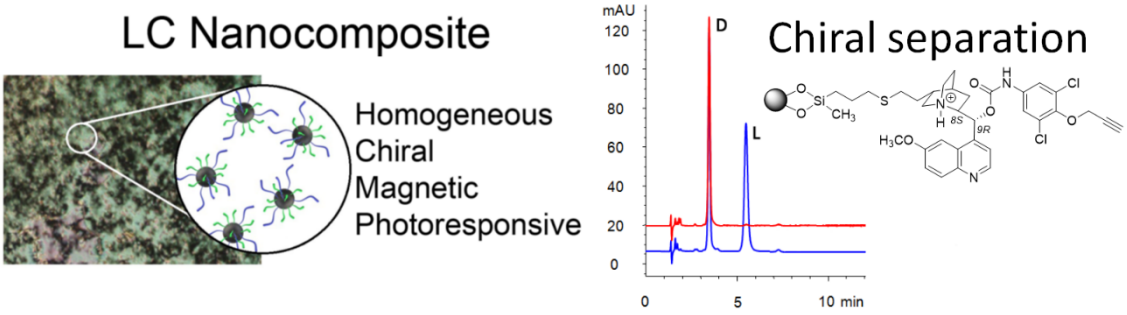

Fig. 1 Schematic representation of a nanocomposite (left) and chiral separation (right).

References

1. A. Poryvai, M. Šmahel, M. Švecová et al. *ACS Nano*, **2022**, *16*, 11833-11841.
2. J. Herciková, D. Spálovská, P. Frühauf, et al. *J. Sep. Sci.*, **2021**, *44*, 3348-3356.
3. M. Kohout, S. Wernisch, J. Tůma, et al. *J. Sep. Sci.*, **2018**, *41*, 1355-1364.
4. M. Labíková, J. Svoboda, J. Tůma, et al. *J. Chromatogr. A*, **2024**, *1719*, 464729.
5. I. Varfaj, M. Labíková, R. Sardella, et al. *Anal. Chim. Acta*, **2024**, *1314*, 342791.