

Colloquium

The relation between chiral molecules and the electron spin-The key to almost everything

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Spin based properties, applications, and devices are commonly related to magnetic effects and to magnetic materials. However, we found that chiral organic molecules act as spin filters for photoelectrons transmission, in electron transfer, in electron transport.

The new effect, termed Chiral Induced Spin Selectivity (CISS), [1, 2] was found, among others, in bio-molecules and in bio-systems. It has interesting implications for the production of new types of nano-size spintronics devices [3, 4] and on electron transfer in biological systems. We observed that charge polarization in chiral molecules is accompanied by spin polarization. This finding sheds new light on enantio-specific interactions and it allows to construct novel methods for enantio-separation. [5] It also opens new ways in interface-spintronics, when chiral molecules are adsorbed on semiconductor surfaces [6] or on ferromagnetic substrates.

References:

- [1] R. Naaman, Y.Paltiel, David Waldeck, Nature Reviews Chemistry 3, 250 (2019).
- [2] R. Naaman, D. H. Waldeck Ann. Rev. Phys. Chem. 66, 263 (2015).
- [3] O. Ben Dor, S. Yochelis, A. Radko, K. Vankayala, E. Capua, A. Capua, S.-H. Yang, L. T. Baczewski, S. S. P. Parkin, R. Naaman, and Y. Paltiel, Nat. Comm., 8, 14567 (2017).
- [4] K. Michaeli, V. Varade, R. Naaman, D. Waldeck, Journal of Physics: Condensed Matter, 29, 103002 (2017).
- [5] K. Banerjee-Ghosh, O. Ben Dor, F. Tassinari, E. Capua, S. Yochelis, A. Capua, S.-H. Yang, S. S. P. Parkin, S. Sarkar, L. Kronik, L. T. Baczewski, R. Naaman, Y. Paltiel, Science 360, 1331 (2018).
- [6] E. Z. B. Smolinsky, A. Neubauer, A. Kumar, S. Yochelis, E. Capua, R. Carmieli, Y.Paltiel, R. Naaman, K. Michaeli, J. Phys. Chem. Lett. 10, 1139 (2019).

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4:00 PM (Tea/Coffee at 3:30 PM)

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