Chirality-induced spin selectivity in electron transmission through self-assembled layers of PNA

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The yield of electrons transmitted through chiral molecules can depend on the helicity of the electrons. Chiral molecules can therefore act as spin filters, with the preferred spin orientation depending on the handedness of the molecule. This effect is referred to as the chirality-induced spin selectivity (CISS) effect. Previous experiments have e.g. been performed with monolayers of double-stranded DNA adsorbed on gold [1] and silicon [2] substrates.

In this contribution, we present results of our spin-resolved photoemission experiments performed at room temperature. The samples consist of enantiopure self-assembled monolayers of helical molecules – various types of double-stranded peptide nucleic acid (PNA) – on polycrystalline gold surfaces. The samples are irradiated by a laser at λ = 213nm to generate photoelectrons from the gold substrate which are then transmitted through the adsorbed monolayer. Subsequently, the electrons are analyzed using a Mott polarimeter. We found longitudinal spin polarizations of −6% for left-handed PNA and +25% for right-handed γ-PNA. The results indicate that the adsorbed molecules act as a spin filter.

References:
[1] B. Göhler et al., Science **331**, 894 (2011)
[2] M. Kettner et al., Adv. Mater. Interfaces **3**, 1600595 (2016)