UNIVERSITÄT DUISBURG ESSEN

PHYSIK E=

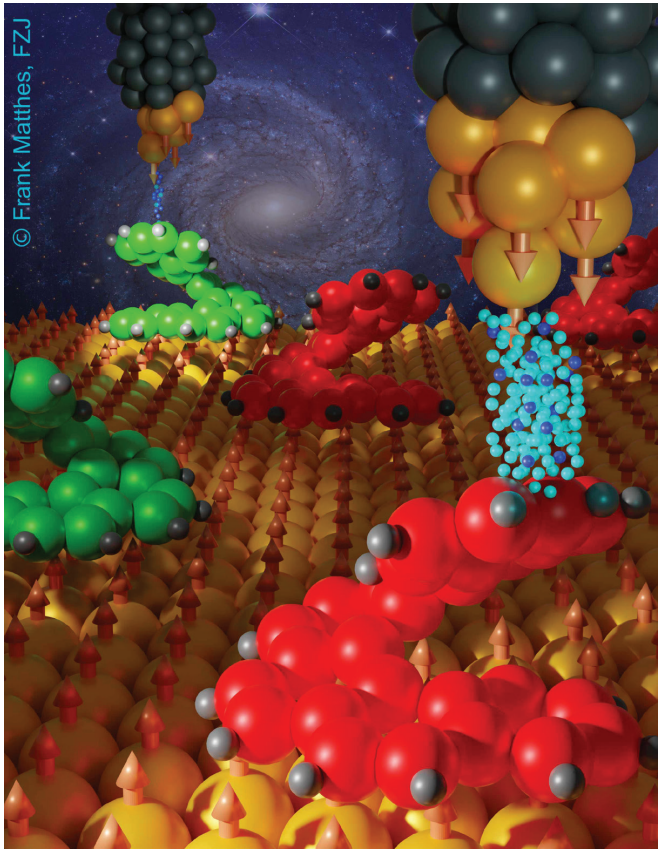
Physikalisches Kolloquium

Mittwoch, 15.04.2026
13:00 Uhr
MC 122 und Zoom

https://uni-due.zoom-x.de/j/64228670246?pwd=RjVQeFNIUkRKRkpiNVpKYXhJaFNLdz09 (gilt für alle Vorträge)

Chirality and Quantum Mechanics

Dr. Daniel E. Bürgler, Peter Grünberg Institut, Forschungszentrum Jülich



Over the last 30 years, experiments have revealed a long-overlooked interaction between structural chirality and moving electron spins, now known as “chirality-induced spin selectivity” (CISS). Numerous experiments on a variety of systems show strong CISS effects and suggest universality, but the underlying physical mechanisms and comprehensive theoretical descriptions remain elusive. Two main CISS effects are spin-selective transfer of electrons through chiral structures and enantiospecific adsorption of chiral molecules on magnetic surfaces. I report these CISS effects for isolated chiral molecules sublimed in UHV onto ferromagnetic Co nanoislands, demonstrating that CISS is a single-molecule effect. We use spin-polarized scanning tunneling microscopy to (i) determine the handedness of individual molecules simultaneously with the magnetization direction of the underlying Co island and (ii) measure spin-polarized transport through individual molecules. Statistical analysis confirms enantioselective adsorption [1]. Pairs of I-V curves for opposite molecular handedness, or opposite tip or substrate magnetization, show conductance asymmetries up to 50% at 5 K [2]. Issues with the theoretical explanation of these asymmetries are discussed.

[1] R. Safari, D.E. Bürgler et al., Adv. Mater. 36, 2308666 (2024)
[2] R. Safari, D.E. Bürgler et al., Small 20, 2308233 (2024)