

Enantio-Separation of Chiral Molecules using Magnetic Substrates

Yossi Paltiel
Hebrew University, Israel

Enantio-selectivity is an imperative in nature and many molecules in living organisms possess specific enantiomeric properties. It is commonly assumed that recognition of chirality and enantio-selection, both in nature and in artificial systems, are solely related to spatial effects, with the recognition process typically described using a “lock and key”-type model. We present a new quantum spin interaction which enables enantio-selection. In recent years, it has been suggested that charge redistribution in chiral molecules induces, enantio-specific electron preferred spin orientation (The Chiral-Induced Spin Selectivity (CISS) effect). These results led to the proposal that the spin polarization may affect enantio-recognition as well as other processes in Biology.

In the talk I will give a short introduction about the CISS effect and why it is important for spin based devices. Then we show experimentally and explain that the interaction of chiral molecules with a perpendicularly magnetized magnetic substrate is enantio-specific. Thus, one enantiomer adsorbs preferentially when the magnetic dipole is pointing up, whereas the other is adsorbed faster for the opposite alignment of the magnetization direction. This allows for a generic enantiomeric separation technique. The interaction is not controlled by the magnetic field, but rather by the electron spin orientation. These results are important for chemists and biologists and are highly relevant for both basic and applied studies

Biography:

Professor Yossi Paltiel is now in the Applied Physics Department in the Hebrew University of Jerusalem Israel. Prof. Paltiel has worked for both leading high-tech industry groups and in the academic world. Since July 2009, he is the leading the Quantum Nano Engineering group at the Hebrew University, Israel. Paltiel's group's goal is to establish a way to incorporate quantum mechanics into room temperature “classical” computation and reading schemes. Professor Paltiel has published more than 100 papers in leading journals as well as issued 13 patents. Paltiel has a startup company named Valentis Nanotech founded in 2013.