SPIN POLARISATION OF ELECTRONS USING CHIRAL MOLECULAR POTENTIALS

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We present a model for the transmission of spin-polarized electrons through oriented chiral molecules, where the chiral structure is represented by a helix. The scattering potential contains a confining term and a spin-orbit contribution that is responsible for the spin-dependent scattering of the electrons by the molecular target. The differential scattering cross-section is calculated for right- and left-handed helices and for arbitrary electron spin polarizations. We apply our model to explain chiral effects in the intensity of photo-emitted polarized electrons transmitted through thin organic layers. These are spin-active molecular interfaces that exhibit electron dichroism and a number of remarkable magnetic properties. In our model, differences in intensity are generated by the preferential transmission of electron beams whose polarization is oriented in the same direction as the sense of advance of the helix. This model can be easily extended to the Landauer regime of conductance, where conductance is due to elastic scattering, so that we can consider the conductance of chiral molecular junctions. Further experiments that probe the effects of chirality in electron transport are suggested.