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Theoretical study of spin Hall effect in conjugated Organic semiconductors. M.R. MAHANI, A. DELIN, Department of Materials and Nanophysics, KTH Royal Institute of Technology — The spin Hall effect (SHE), a direct conversion between electronic and spin currents, is a rapidly growing branch of spintronics. The study of SHE in conjugated polymers has gained momentum recently due to the weak spin-orbit couplings and hyperfine interactions in these materials. Our calculations of SHE based on the recent work [1], are the result of the misalignment of pi-orbitals in triads consisting of three molecules. In disordered organics, where the electronic conduction is through hopping of the electrons among randomly oriented molecules, instead of identifying a hopping triad to represent the entire system, we numerically solve the master equations for electrical and spin hall conductivities by summing the contributions from all triads in a sufficiently large system. The interference between the direct and indirect hoppings in these triads leads to SHE proportional to the orientation vector of molecule at the first order of spin-orbit coupling. Hence, our results show, the degree of molecular alignment as well as the strength of the spin-orbit coupling can be used to control the SHE in organics. [1] Z. G. Yu, PRL 115, 026601 (2015).

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