The occurrence of magnetic field effects (MFEs) in the light emission and conductance of organic devices keeps on puzzling scientists. Striking aspects are 1) no ferromagnetic electrodes are needed, 2) their large size (sometimes over 20%), 3) the small involved magnetic fields (~mT), and 4) their occurrence at room temperature. Consensus is arising that the effects are related to a magnetic field (B) dependent mixing of the spin states of precursor pairs of reacting spin-carrying species, which can be electrons, holes, and triplet excitons. However, the precise mechanisms are still under debate.

Recently, an ultrahigh room-temperature magnetoresistance (MR) of over 2000% was discovered in 1D wires of molecular wires inserted in pores of a zeolite crystal [1]. All present indications are that the effect has the same origin as the MFEs in organic devices. We explain the effect by a B-dependent spin blockade in the formation of doubly charged molecules in the wires, acting as transient states in the charge transport. This is corroborated by the observation that in films of the used molecule, where there are pathways around the blockade, the effect is significantly weaker. Our theoretical predictions are that in 1D organic systems MRs of the order of 5000-6000% should finally be attainable [2].


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