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Molecular controlled of quantum nano systems

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A century ago quantum mechanics created a conceptual revolution whose fruits are now seen in almost any aspect of our day-to-day life. Lasers, transistors and other solid state and optical devices represent the core technology of current computers, memory devices and communication systems. However, all these examples do not exploit fully the quantum revolution as they do not take advantage of the coherent wave-like properties of the quantum wave function. Controlled coherent system and devices at ambient temperatures are challenging to realize. We are developing a novel nano tool box with control coupling between the quantum states and the environment. This tool box that combines nano particles with organic molecules enables the integration of quantum properties with classical existing devices at ambient temperatures. The nano particles generate the quantum states while the organic molecules control the coupling and therefore the energy, charge, spin, or quasi particle transfer between the layers. Coherent effects at ambient temperatures can be measured in the strong coupling regime. In the talk I will present our nano tool box and show studies of charge transfer, spin transfer and energy transfer in the hybrid layers as well as collective transfer phenomena. These enable the realization of room temperature operating quantum electro optical devices. For example I will present in details, our recent development of a new type of chiral molecules based magnetless universal memory exploiting selective spin transfer.