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Molecular Spintronics using Molecular Nanomagnets

WOLFGANG WERNSDORFER, CNRS, Institut Neel

A revolution in electronics is in view, with the contemporary evolution of two novel disciplines, spintronics and molecular electronics. A fundamental link between these two fields can be established using molecular magnetic materials and, in particular, single-molecule magnets [1], which combine the classic macroscale properties of a magnet with the quantum properties of a nanoscale entity. The resulting field, molecular spintronics aims at manipulating spins and charges in electronic devices containing one or more molecules. In this context, we want to fabricate, characterize and study molecular devices (molecular spin-transistor, molecular spin-valve and spin filter, molecular double-dot devices, carbon nanotube nano-SQUIDs, etc.) in order to read and manipulate the spin states of the molecule and to perform basic quantum operations. The talk will discuss this–still largely unexplored–field and present our the first important results [2,3].

[1] L. Bogani & W. Wernsdorfer, Nature Mat. 7, 179 (2008).
[2] J.-P. Cleuziou, W. Wernsdorfer, V. Bouchiat, T. Ondarçuhu, M. Monthioux, Nature Nanotech. 1, 53-59 (2006).
[3] N. Roch, S. Florens, V. Bouchiat, W. Wernsdorfer, F. Balestro, Nature 453, 633 (2008).