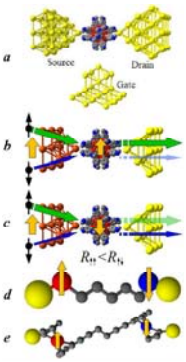
Journées J3N Nationales en Nanosciences et en Nanotechnologies

Molecular spintronics using single-molecule magnets

ANR: MolNanoSpin 08-NANO-002 Nano composants

• Linking the ideas of three disciplines:
spintronics, molecular electronics, and quantum computing

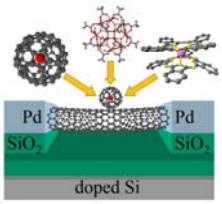
• Manipulating spins and charges in electronic devices containing one or more molecules to **perform basic quantum operations**



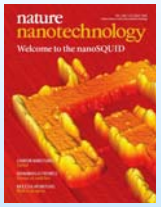
Project: Fabrication, characterization and study of molecular devices

- **molecular spin-transistor**
- **molecular spin-valve and spin filter**
- **molecular double-dot devices**
- **nanoresonator magneto-mechanic**
- **carbon nanotube nano-SQUIDs**

etc.



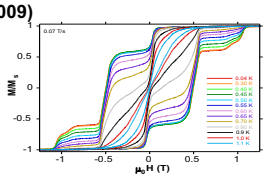
L. Bogani & W. Wernsdorfer, *Nature Mat.* 7, 179 (2008)



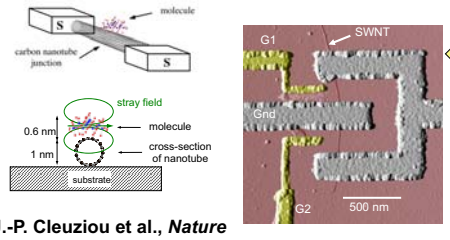
Single-molecule magnets (SMM)

Fe_6-POM
S = 5

J.-D. Compain et al., *Angew. Chem. Int. Ed.* 48, 3077 (2009)



Nano-SQUID

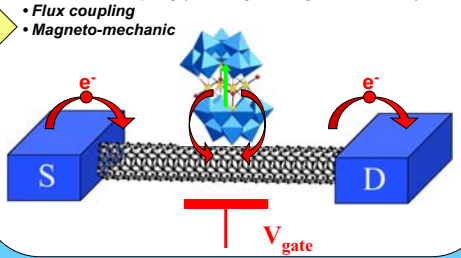


J.-P. Cleuziou et al., *Nature Nanotech*, 1, 53 (2006)

Molecular double-dot devices

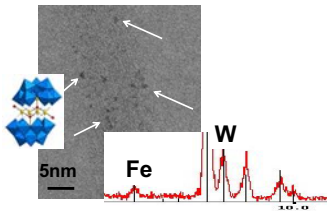
Nanotube - SMM coupling

- ***Electronic coupling (exchange & magnetoCoulomb)***
- ***Flux coupling***
- ***Magneto-mechanic***

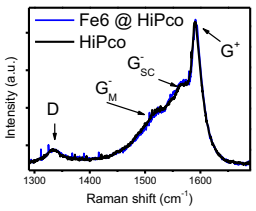


Grafting of SMMs on carbon nanotubes

TEM imaging

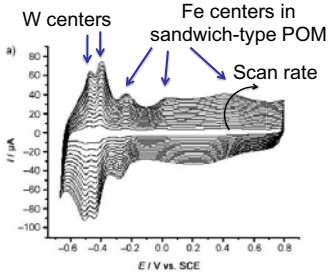


Raman spectroscopy

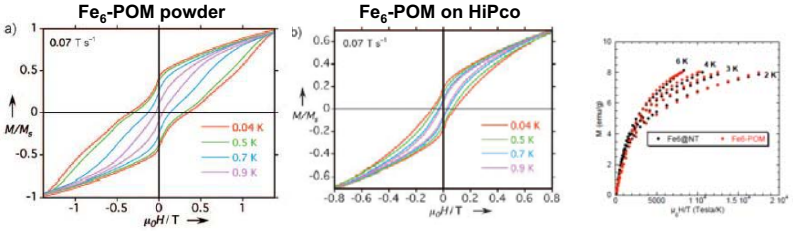


Electrochemical characterization

Stepwise reduction of Fe^{III} centers sandwiched between W skeleton



MicroSquid measurements:
Single Molecule Magnet behaviour



A. Giusti, et al., *Angew. Chem. Int. Ed.* 48, 4949 (2009)

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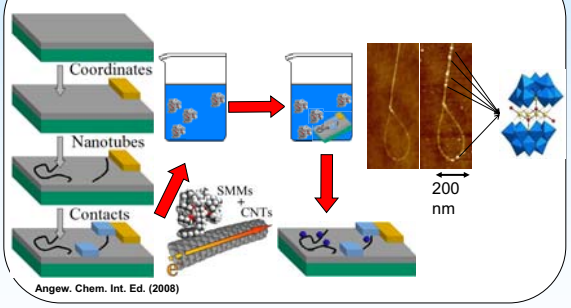
Grafting of SMMs on devices



Angew. Chem. Int. Ed. (2008)

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