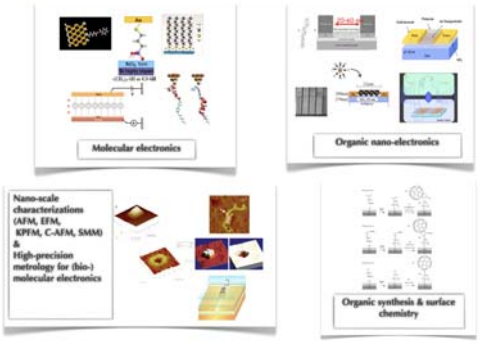
Nanostrutures, nanoComponents & Molecules
NCM GROUP

Permanent staffs : F. Alibart, N. Clément, D. Guérin, S. Lenfant, K. Lmimouni, D. Vuillaume
Non Permanent staffs : S. Desbief, S. la Barbera, S. Pleutin, S. Punniyakoti, G. Ricoeur, K. Smaali, R. Sivakumarasamy, J. Trasobares, Y. Viero, T. Zhang

Objectives & Projetcs

Research topics



Main research objectives

- design and characterization of molecular and nanoscale electronic devices
- elucidation of fundamental electronic properties of these molecular and nanoscale devices
- study of functional molecular devices and integrated molecular systems
- exploration of new computing paradigms using molecules and nanostructures

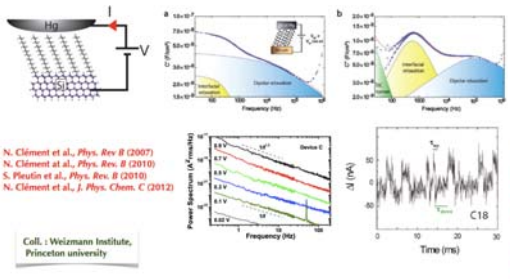
Ongoing funded projects

- SELF-ASSEMBLED NANO-DIELECTRICS ON GE AND III-V MATERIALS *(SAGE III-V) (2012-2015) / ANR-BLANC*
- IMPLANTABLE ORGANIC NANO-ELECTRONICS *(I-ONE) (2012-2015) / EU-FP7-NMP*
- SYNAPTIC MOLECULAR NETWORKS FOR BIO-INSPIRED INFORMATION PROCESSING *(SYMONE) (2012-2015) / EU-FP7-FET*
- MICROWAVE NANOTECHNOLOGY FOR SEMICONDUCTOR AND LIFE SCIENCES *(NANOMICROWAVE) (2012-2015) / EU-FP7-PEOPLE-ITN*
- DEVELOPMENT AND INTEGRATION OF NANOSCALE MEMRISTIVE DEVICES FOR NEURO-INSPIRED COMPUTING SYSTEMS *(DINAMO) (2013-2015) / ANR-PDOC*
- SYNAPSE-LIKE TRANSISTOR AND CIRCUITS FOR NEURO-INSPIRED COMPUTING ARCHITECTURE *(SYNAPTOR) (2013-2015) / ANR-BLANC*
- FOUR STATE MOLECULAR DEVICES *(FOST) (2013-2015) / ANR-BLANC*
- POLYOXOMETALATE CHEMISTRY FOR MOLECULAR NANOSCIENCE *(POCHEMON) (2012-2016) / EU-COST*
- SUB-ELECTRON-SENSITIVE SILICON ELECTROMETER FOR SINGLE BIO-MOLECULES DETECTION AND STUDY. *(SINGLEMOL) (2013-2015) / REGION NPDC*
- EXPERIMENTAL CENTER FOR LARGE SPECTRUM PROPERTIES OF NANOSTRUCTURES FROM DC TO MID-INFRARED *EXCELSIOR (2012-2014) / EQUIPEX*

Molecular junctions & devices

Physics of molecular junctions

- Noise (1/f, RTS) and dipolar dynamics in model MJ

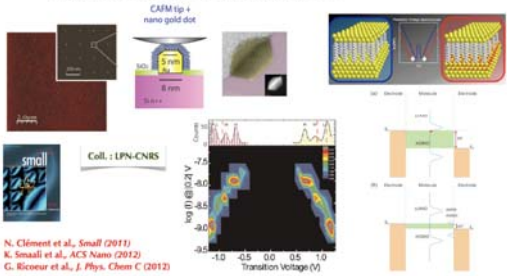


N. Clément et al., *Phys. Rev B* (2007)
N. Clément et al., *Phys. Rev. B* (2010)
S. Pleutin et al., *Phys. Rev. B* (2010)
N. Clément et al., *J. Phys. Chem. C* (2012)

Coll. : Weizmann Institute, Princeton university

Physics of molecular junctions

- Nano-dot MJ for easy statistics with a C-AFM
- Molecule/electrode energetics by TVS

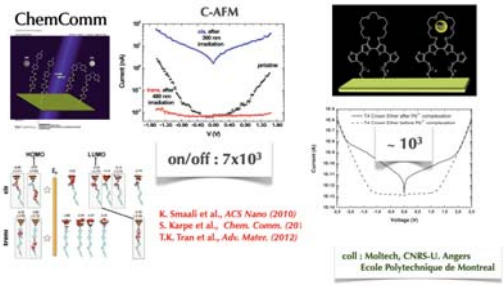


N. Clément et al., *Small* (2011)
K. Smaali et al., *ACS Nano* (2012)
G. Ricoeur et al., *J. Phys. Chem C* (2012)

Coll. : LPN-CNRS

Functional molecular devices

- High on/off ratio, high speed, molecular switches



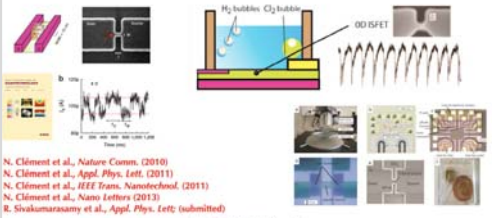
K. Smaali et al., *ACS Nano* (2010)
S. Karpe et al., *Chem. Comms.* (20)
T.K. Tran et al., *Adv. Mater.* (2012)

coll : Moltech, CNRS-U. Angers
Ecole Polytechnique de Montreal

Organic & hybrid devices

0D Si-SET for molecular electronics

- Sub-electron sensitive electrometer to detect dynamics of single molecules and bio-molecules.



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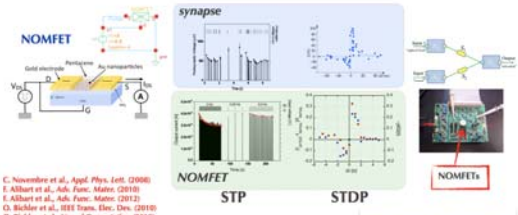
N. Clément et al., *Appl. Phys. Lett.* (2011)
N. Clément et al., *IEEE Trans. Nanotechnol.* (2011)
N. Clément et al., *Nano Letters* (2013)
R. Sivakumarasamy et al., *Appl. Phys. Lett;* (submitted)

Coll. : NTT-BRL (Tokyo)
ICSM (Marcoule)

Neuro-inspired organic electronics

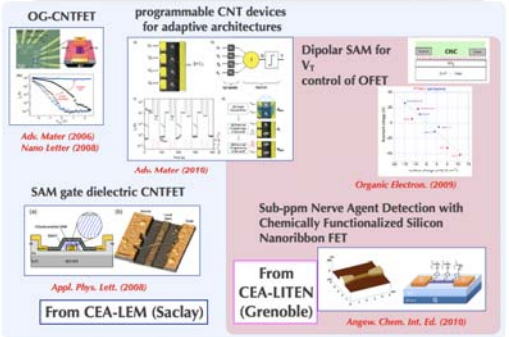
- Organic SYNAPSTOR (synapse-transistor) for neuro-inspired computing : the NOMFET (nano-particle organic memory field effect transistor).



C. Novembre et al., *Appl. Phys. Lett.* (2008)
F. Alibart et al., *Adv. Func. Mater.* (2010)
F. Alibart et al., *Adv. Func. Mater.* (2012)
O. Bichler et al., *IEEE Trans. Elec. Dev.* (2010)
O. Bichler et al., *Neural Computation* (2013)

Coll. : CEA-LIST & LEM (Saclay)
Chalmers Univ. (Sweden)
IMSE-Sevilla (Spain)

Collaborations to highlights from other groups



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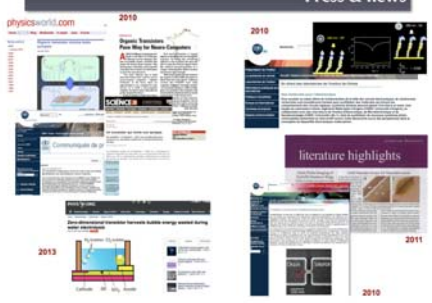
Appl. Phys. Lett. (2008)
Angew. Chem. Int. Ed. (2010)

More info at : http://ncm.iemn.univ-lille1.fr

Press & news



Group specific equipments

iemn
Institut d'Electronique, de Microélectronique et de Nanotechnologie
UMR CNRS 8520

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