

CEA NIMBE : Nanosciences et Innovation pour les Matériaux, la Biomédecine et l'Energie (UMR 3685)

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NIMBE/LEDNA

- Number of people, important team or departments: 7 teams (LAPA, LCMCE, LEDNA, LEEL, LICSEN, LIONS, LSDRM)
- Number of people involved in the GDR
12 person likely to be interested in GDR issues (workshops 1 and 5)

- Area of expertise of the labs:

Chemistry of nanomaterials

research activities in chemistry and physico-chemistry mainly focused on the design, shaping and analysis of matter from the functional scale to the nanometric scale as well as the understanding of physicochemical mechanisms and their synergies.

- Which preferential axes ? élaboration + mesures de propriétés et de performances de dispositif

AXE
Élaboration
Mesures de propriétés
Mesures de performances de dispositif
Simulations/Théorie

CEA NIMBE : Nanosciences et Innovation pour les Matériaux, la Biomédecine et l'Energie

LEDNA

Nano-objects synthesis
Characterization
synthesis mechanisms

LICSEN

Synthesis,
characterization
electrochemistry
Devices conception

LIONS

ageing radiolysis
reactional
mechanisms
understanding



LEEL

microprobe/ batteries
coupling
Synthesis/electrochemistry

LSDRM

RMN studies: structure
and dynamic



N A M e

GDR Nanomaterials for Energy Applications

ELABORATION
MEASUREMENTS & METROLOGY
SIMULATIONS & THEORY
APPLICATIONS

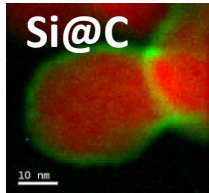
nanosciences & innovation



'Nanomaterials for energy' studied at CEA NIMBE:

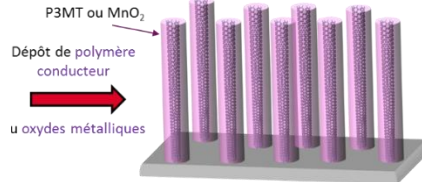
Li-ion

- Negative electrodes



- Aging (radiolysis, nuclear microprobe)

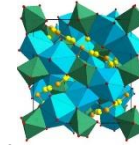
Supercap.



Control of CNT CVD synthesis
CNT coating

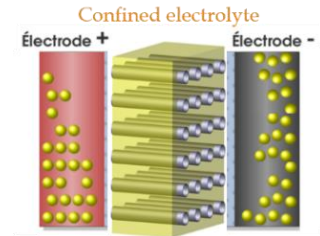
Solid state batteries

- Synthesis of solid electrolytes



- characterization

1D Electrolyte

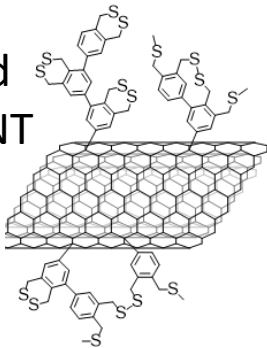


Confined IL, polymers
Collab LITEN



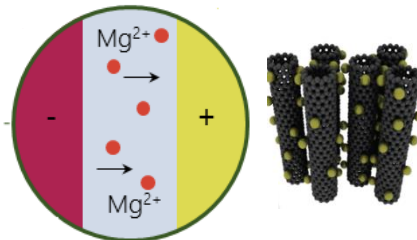
Li-orga/Li-S

grafted
MWCNT



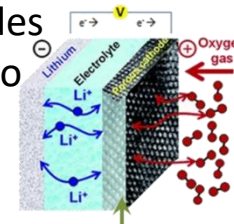
Mg-ion

Negative electrodes



Metal-air

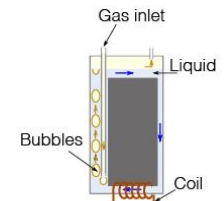
- Cathodes
NTC electro
-spinning



- In situ NMR



Redox flow



RMN operando
Instrumentation



Scientific expertise, overview, major themes in relation to the GDR

- Back bone of the labs regarding chemistry or physics (main research subject)

Elaboration: Liquid and Gas phase synthesis of nanomaterials (flame spray and laser pyrolysis, CVD...), solid-solid, mechanical alloying, wet chemistry

Characterization and properties (electrochemistry, impedance spectroscopy) of batteries, supercapacitors and fuel cells materials (electrodes and solid electrolytes)

- Which heat carriers ?
- Type of energy conversion
- What kind of applications are targeted ?
development of materials for batteries / supercapacitors; fuel cells; photovoltaics; CO₂ conversion, Photo(electro)catalysis
+ catalysis (CO₂ reduction, fuel cells, etc.), specific complexation (NMR probes, gas detectors, purification of rare earths, etc.), reversible capture-release of ions (batteries, pollution control), electronic or ionic conductivity (ultralight cables, solid electrolytes, electrode materials for photovoltaics or supercapacitors) properties

Porteurs d'énergie
Phonon
Electron
Type de conversion d'énergie
Thermoélectrique
Photovoltaïque
Thermophotovoltaïque
Piézoélectrique
Application relative à l'énergie ou autre
Récupération
Stockage
Capteurs
Gestion thermique des nanodispositifs
Dispositifs flexibles
Performances/fiabilité des nanodispositifs
Alimentation/Nano-robotique
Autre ?

Technical or technological expertise in relation to the GDR issues

- What kind of materials/dimensions:
metal, oxides or carbon nano-objects as well as nanostructured materials such as porous or composites
- Bottom-up or top-down ? Bottom up
- What kind of elaboration techniques
synthesis of nano-objects in gas and liquid phase and organic synthesis
- What kind of characterization technique are mastered by the lab/group/team

leading instrumentation park dedicated to material characterization from solid material to the nanometer scale (X-ray scattering and diffraction,, electron accelerator, electron and optical microscopies, liquid and solid NMR, XPS, Raman, local probe AFM and SECM microscopies, ICPMS...) + synchrotron radiation (Soleil...), electron microscopy platforms available on the Paris-Saclay perimeter (NanoTEM at C2N, CIMEX at Polytechnique, etc.) and at neutrons sources (LLB, ILL).

- Special instruments or methods (give few highlights)

- Nuclear microprobe analysis:

Particular sensitivity for light elements (Li), Spatial resolution ~ (mm x mm x 0.1 mm), adapted to operando analysis

workshop 5

- Radiolysis for ageing studies (physico-chemistry under radiation)

Looking for Scientific exchanges, setting up of collaborative projects and joint projects

Caractéristiques physicochimiques
Caractérisation microstructurale
Electrique
Thermique
Mécanique
Magnétique
Autre ?
Type et taille caractéristiques des nanomatériaux
Élaboration
Caractérisation d'objets
Simulations