C'Nano

THE NANOSCIENCE MEETING

2023

·Nanophotonics & Nano-optics ·Nanochemistry, Nanoparticles, Nanocatalysis·
·Nanobiosciences·Nanomechanics·Nanotechnology for cleaning environment·
·Functional thin Films & Nanostructures·Nano-electronics·
·Nanoscale heat transfer - Measurement·
·Nanomaterials for Energy·2D Materials.

Poitiers

March, 15, 16 and 17

PLENARY SPEAKERS

Sarah BENCHABANE-GAIFFE (CNRS - FEMTO-ST)
Eric COLLET (Univ. Rennes 1 - IPR)
Laura NA LIU (Univ. Stuttgart - 2nd Physics Institute)
Guillaume SCHULL (CNRS - IPCMS)
Chantal PICHON (Univ. Orleans - CBM)

Organized by:

cnrs C'Nano

https://cnano2023.sciencesconf.org

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In partnership with:

Université de Poitiers

INSTITUT P' IC2MP

INTREE Graduate School of Research

SFO Société Française d'Optique

With the contribution:

C'Nano NORD-OUEST

Clubnano Métrologie

Laboratoire National de Métrologie et d'Essais LNE

Société Chimique de France

GDR NINO

NAME GDR Nanomaterials for Energy Applications

RENATECH

Sponsored by:

Labex Interactifs

NAME GDR Nanomaterials for Energy Applications

INTREE Graduate School of Research

NKT Photonics

SON

For more information about the « C'Nano 2023: The Nanoscience Meeting », scan the QR code below!

https://colibris.link/cnano23

To tweet about the Congress please use:
#CNANO23
To tag us use:
@CNano_national

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Introduction

Forewords

Corinne CHANEAC

Director of C'Nano

For the fifth year, the French national competency cluster in Nanoscience of CNRS, C'Nano, organizes its **scientific interdisciplinary congress in nanoscience**. The *« C'Nano 2023 - The Nanoscience Meeting »* new edition wilk take place in Nouvelle Aquitaine region (France) in Futuroscope Congress Center near Poitiers, from March 15th to 17th, 2023.

This national event aims at **bringing together the various scientific communities** concerned by nanoscience and nanotechnology. It is addressed to all scientists from academic laboratories and industry: researchers, lecturers, engineers, master's and PhD students, post-docs, etc.

The program will include **5 plenary lectures and 10 parallel sessions** on topics at the interface of various research areas in nanoscience. Altogether, they will involve **31 invited internationally recognized speakers** from France and abroad.

Moreover, around 200 additional scientific contributions are expected through oral and poster presentations. An **exhibition area** will be organized **for congress sponsors and partners.**

In addition, three special events and sessions will punctuate the program
Nanopitch, an eloquence contest in nanoscience dedicated to large public will be organized, on Wednesday March 15th evening. This event will highlight PhD work in nanoscience and nanotechnology.

« Art & Science » exhibition area will be dedicated to artistic performances and will be a privileged place for exchanges and discussions between researchers and artists.
Session on innovation will be ponctuated by an experience feedback from a researcher followed by a rountable involving local innovation stakeholders.

Moreover, **satellite event** will take place one day before the congress, on Tuesday March 14th, 2023: the annual scientific meeting of the **PEPR on Electronics**, co-steered by CNRS and CEA.

Last, three specific ceremonies will take place:

- the first one will **reward the remarkable involvment and results of PhD students**, who recently defended their PhD thesis on a topic in nanoscience and nanotechnology;
- the second one, will reward the **best oral and poster presentations of the congress** given by master's students, PhD students or post-docs during the congress.
- the last one will **reward laureates of the Art & Sciences" Image Prizes**

More than 400 academics and industrials will attend the congress.

I wish you a pleasant and scientifically stimulating congress!

Corinne Chaneac,
Director of C'Nano

Introduction

C'Nano, the National Competency Cluster in Nanoscience, is a CNRS service unit promoting research in nanoscience. C'Nano structures the French scientific community in "nano" by gathering physicists, chemists, engineers, biologists, physicians, sociologists, economists, jurists, etc. within a national pluridisciplinary network. C'Nano main missions include: promoting interdisciplinary research at the regional and national levels; supporting education and science-society exchanges; stimulating public/private partnerships and technological transfer; and finally implementing prospective studies to sustain the development of nanoscience and nanotechnology. Through these missions, C'Nano aims at contributing to the emergence of new ideas to face scientific, economic and societal challenges in nanoscience.

National board

The national board organises the implementation of C'Nano actions.

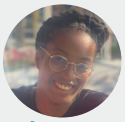
Direction

Corinne CHANEAC
Director

Julie CARIMALO
Administrative Head
& Scientific Coordinator

Administrative team

Christophe DECILAP
Administrative
& Financial Officer



Maéva LUBIN
Communication
& Events Officer

Scientific steering committee

The scientific steering committee is composed of the C'Nano territorial boards coordinators, whose mission is to locally apply and spread the C'Nano activities and strategy.

C'Nano Ile-de-France	**Corinne CHANEAC** Sorbonne Univ. - LCMCP, Paris	**Ariel LEVENSON** CNRS - C2N, Palaiseau	cnano_idf@cnrs.fr
C'Nano Nord-Ouest	**Jean-Luc DUVAIL** Nantes Univ. - IMN, Nantes	**Fabienne GAUFFRE** CNRS - ISCR, Rennes	cnano_no@cnrs.fr
C'Nano Grand-Sud-Ouest	**Xavier BOUJU** CNRS - CEMES, Toulouse	**Yannick GUARI** CNRS - ICGM, Montpellier	cnano_gso@cnrs.fr
C'Nano Provence-Alpes-Côte d'Azur	**Nicolas BONOD** CNRS - Fresnel Inst. , Marseil	**Lionel SANTINACCI** CNRS - CINaM, Marseille	cnano_paca@cnrs.fr
C'Nano Auvergne-Rhône-Alpes	**Anthony AYARI** CNRS - ILM, Lyon	**Bruno MASENELLI** INSA Lyon - INL, Lyon	cnano_aura@cnrs.fr
C'Nano Est	**Michel VERGNAT** Lorraine Univ. - IJL, Nancy	**Nadine MILLOT** Burgundy Univ. - ICB, Dijon	cnano_est@cnrs.fr

Sponsors & Partners

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With the contribution of

Organizing committees

For this 5th edition, C'Nano relies heavily on its North-Western board (C'Nano NO) and works closely with the University of Poitiers, the Pprime institute and IC2MP laboratory localized in Poitiers.

National organizing committee

Corinne CHANEAC
Head of C'Nano
(Sorbonne University – C'Nano)

Julie CARIMALO
Administrative Head & Scientific Coordinator
(CNRS – C'Nano)

Christophe DECILAP
Administrative & Financial Officer
(CNRS – C'Nano)

Maéva LUBIN
Communication & Events Officer
(CNRS – C'Nano)

Local organizing committee

David BABONNEAU
(CNRS – Pprime, C'Nano NO)*

Yves ALMECIJA (CNRS – CeRCA, IC2MP)

Stéphane CELERIER (CNRS – IC2MP)

Julien GODET (Poitiers Univ. – Pprime)

Claudia GOMES DE MORAIS
(Poitiers Univ. – IC2MP)

Elisabeth NAU (CNRS – IC2MP)

Loranne VERNISSE (Poitiers Univ. – Pprime)

Scientific committees

Nanophotonics & Nano-optics

Anne-Ségolène CALLARD (Ecole Centrale of Lyon – INL, Lyon)*
Erik DUJARDIN (CNRS – ICB, Dijon)*
Anne-Laure FEHREMBACH (AMU – Fresnel Institute, Marseille)
Yannick DE WILDE (CNRS – Langevin Institute, Paris)
Jean-Luc DUVAIL (University of Nantes – IMN, Nantes)
Antoine MONMAYRANT (CNRS – LAAS, Toulouse)

Nanochemistry, Nanoparticles, Nanocatalysis

in partnership with the CNRS research group GdR Nino and the GECAT group of the French Chemistry Society (SCF)

Fabien CAN (Univ. Poitiers – IC2MP, Poitiers)*
Florence EPRON (CNRS – IC2MP, Poitiers)*
Manuel GAUDON (Univ. Bordeaux – ICMCB, Bordeaux)
Ksenia PARKHOMENKO (CNRS – Institut Langevin, Paris)
Jean-Yves PIQUEMAL (Univ. Paris Cité – ITODYS, Paris)
Myrtil KAHN (CNRS – LCC, Toulouse)

Nanobiosciences

Frédéric AFFOUARD (Univ. Lille – UMET, Lille)
Philippe BERTRAND (Univ. Poitiers – IC2MP, Poitiers)
Adeline BOIRE (INRAE – BIA, Nantes)
Fabienne GAUFFRE (CNRS – ISCR, Rennes)*
Nadine MILLOT (Univ. Bourgogne – ICB, Dijon)*
Stéphane MORNET (CNRS – ICMCB, Bordeaux)

Nanomechanics: surface/ interface, composite nanomaterials, hybrid nanomaterials

Aurélien CRUT (Univ. Lyon – ILM, Lyon)
Stéphanie ESCOUBAS (AMU – IM2NP, Marseille)
Damien FAURIE (Sorbonne Univ. Paris Nord – LSPM, Villetaneuse)*
Julien GODET (Univ. Poitiers – Pprime, Poitiers)*
Barbara PUTZ (Montanuniversität Leoben – Structural & Functional Ceramics, Leoben)

Nanoscale heat transfer - Measurement

In partnership with the Club nanoMétrologie French network, LNE and GDR NAME CNRS research network

Jérémie DREVILLON (Univ. Poitiers – Pprime, Poitiers)*
Nolwenn FLEURENCE (LNE, Trappes)*
Séverine GOMES (CNRS – CETHIL, Lyon)
Raphaël SOMMET (CNRS – X-LIM, Limoges)

** Session Coordinators*

Scientific committees

Nanomaterials for Energy

In partnership with the GDR NAME CNRS research network

Claudia GOMES DE MORAIS (Univ. Poitiers – IC2MP, Poitiers)*
Liliane GUERLOU-DEMOURGUES (Bordeaux INP– ICMCB, Bordeaux)
Jérôme PACAUD (Univ. Poitiers – Pprime, Poitiers)*
David PORTEHAULT (CNRS – LCMCP, Paris)
Lionel SANTINACCI (CNRS – CINaM, Marseille)

2D Materials

Stéphane CELERIER (CNRS – IC2MP, Poitiers)*
Catherine JOURNET-GAUTIER (Lyon Univ. – LMI, Lyon)
Laurence MASSON (AMU – CINaM, Marseille)
Geoffroy PREVOT (CNRS – INSP, Paris)
Loranne VERNISSE (Univ. Poitiers – Pprime, Poitiers)*

Functional thin Films & Nanostructures: growth & properties

in partnership with the scientific community in nanowires field & French J2N Meeting organizers

Amandine BELLEC (CNRS – MPQ, Paris)
Rémi LAZZARI (CNRS – INSP, Paris)*
Julian LEDIEU (CNRS – IJL, Nancy)
Frédéric LEROY (AMU – CINaM, Marseille)
Anny MICHEL (Univ. Poitiers – Pprime, Poitiers)

Nanotechnology for cleaning environment

Isabelle BATONNEAU-GENER (Univ. Poitiers – IC2MP, Poitiers)*
Xavier COURTOIS (Univ. Poitiers – IC2MP, Poitiers)*
Lavinia BALAN (CNRS – CEMHTI, Orléans)
Philippe VERNOUX (CNRS – IRCELYON, Lyon)

Nano-electronics

in partnership with PEPR Electronics

Anthony AYARI (CNRS – ILM, Lyon)*
Matthieu JAMET (CEA – SPINTEC, Grenoble)
Philippe BOUCAUD (CNRS – CRHEA, Valbonne)*

** Session Coordinators*

General Program

Wednesday March 15th

8:00 **Registration & Welcome coffee**

9:00 **OPENING SESSION**

Corinne CHANÉAC, Head of C'Nano (Sorbonne University – C'Nano)
David BABONNEAU, Local Coordinator & C'Nano North-Western board member (CNRS – Pprime)
Yves GERVAIS, Vice President of Research at Univ. Poitiers
Pascal BAIN, Head of the ANR SPICE department

9:30 **PLENARY SESSION**

Laura NA LIU, University of Stuttgart – 2nd Physics Institute, Stuttgart (Germany)

10:30 Coffee & tea break

11:00 **THEMATIC SESSIONS**

Nanophotonics & Nano-optics	Nanochemistry, Nanoparticles, Nanocatalysis	Functional thin films & Nanostructures	2D-Materials
Bernhard URBASZEK IPKM, Darmstadt – (Germany)	**Catherine ESPECEL** Univ. Poitiers – IC2MP, Poitiers (France)	**Olivier PIERRE-LOUIS** CNRS – ILM, Lyon (France)	**Yannick FAGOT-REVURAT** Univ. Lorraine – IJL, Nancy (France)

13:00 Lunch, Posters Session & Stands

14:30 **PLENARY SESSION**

Guillaume SCHULL, CNRS – IPCMS, Strasbourg (France)

15:30 **THEMATIC SESSIONS**

Nanophotonics & Nano-optics	Nanomechanics	Nanobiosciences	Nanoelectronics
Céline FIORINI CEA – SPEC, Saclay – (France)	**Eva Maria WEIG** Technical University of Munich Munich – (Germany)	**Nicolas MARTIN** CNRS – CRPP, Bordeaux – (France)	**Maud VINET** SiQuance, Grenoble (France)

16:45 Coffee & tea break

Nanophotonics & Nano-optics	Nanomechanics	Nanobiosciences	Nanoelectronics

18:30 **LARGE PUBLIC EVENT**

- Nanopitch: large-public pitch competition on nanoscience dedicated to PhD Students
- Nanopitch Awards Ceremony

this event will be held in French

19:30 - 22:00 **COCKTAIL DINNER & POSTERS / EXHIBITION STANDS SESSION**

Scientists and large public will be invited to discuss at the « *Art & Sciences* » stand and enjoy the exhibition.

- « *Art & Sciences* » Image Awards Ceremony

Room 13/14	Amphi 150	Room 11/12	Main amphitheater

General Program

Thursday March 16th

8:30 **PLENARY SESSION**

Chantal PICHON, University of Orléans – CBM, Orléans (France)

9:30 **SPONSORS & PARTNERS PRESENTATION**

- **Renatech**
- **EUR Nano-PHOT**
- **EUR INTree**
- **NKT Photonics**

10:00 Coffee & tea break

10:30 **THEMATIC SESSIONS**

Nanomechanics	Nanochemistry, Nanoparticles, Nanocatalysis	Nanobiosciences	2D-Materials
Megan CORDILL ESI – ÖAW, Leoben (Austria)	**Hazar GUESMI** CNRS – ICGM, Montpellier – (France)	**Nadine CANDONI** AMU – CINaM, Marseille – (France)	**Eric FERRAGE** CNRS – IC2MP, Poitiers (France)

12:30 Lunch, Posters Session & Stands

14:30 **PLENARY SESSION**

Sarah BENCHABANE-GAIFFE, CNRS – FEMTO-ST, Besançon (France)

15:30 **THEMATIC SESSIONS**

Nanophotonics & Nano-optics	Nanochemistry, Nanoparticles, Nanocatalysis	Nanobiosciences	Functional thin films & Nanostructures
Kevin VYNCK CNRS – ILM, Lyon (France)	**Jean-Cyrille HIERSO** Univ. Bourgogne – ICMUB, Dijon (France)	**François LUX** Univ. Claude Bernard – ILM, Lyon (France)	**Lisa MICHEZ** AMU – CINaM, Marseille (France)

17:00 Coffee & tea break

Nanophotonics & Nano-optics	Nanochemistry, Nanoparticles, Nanocatalysis	Nanobiosciences	Functional thin films & Nanostructures

19:00 - 19:30 **PHD THESIS AWARDS CEREMONY**

20:30 **GALA DINNER**

Room 13/14 | Amphi 150 | Room 11/12 | Main amphitheater

General Program

Friday March 17th

9:00 **PLENARY SESSION**

Eric COLLET, University of Rennes 1 – IPR, Rennes (France)

10:00 Coffee & tea break

10:30 **THEMATIC SESSIONS**

Nanoscale Heat Transfer	Nanomaterials for energy	Nanotechnology for cleaning environment	Special Session on Innovation*
Simon HURAND Univ. Poitiers – PPrime, Poitiers (France)	**Elena SAVINOVA** Univ. Strasbourg – ICPEES, Strasbourg (France)	**Jean-François LAMONIER** Univ. Lille – Institut Michel-Eugène Chevreul, Lille (France)	**François JEROME** CNRS – IC2MP, Poitiers (France)

** This session will be held in French*

12:30 Lunch, Posters Session & Stands

14:00 **THEMATIC SESSIONS**

Nanoscale Heat Transfer	Nanomaterials for energy & 2D materials	Nanotechnology for cleaning environment	Nanomechanics
David LACROIX Univ. Lorraine – LEMTA, Nancy (France)	**Aurélien HABRIOUX** Univ. Poitiers – IC2MP, Poitiers (France)	**Conchi O. ANIA** CNRS – CEMHTI, Orléans (France)	**Jonathan AMODEO** CNRS – IM2NP, Toulon (France)

15:45 Coffee & tea break

16:15 **BEST ORAL & POSTER AWARDS CEREMONY**

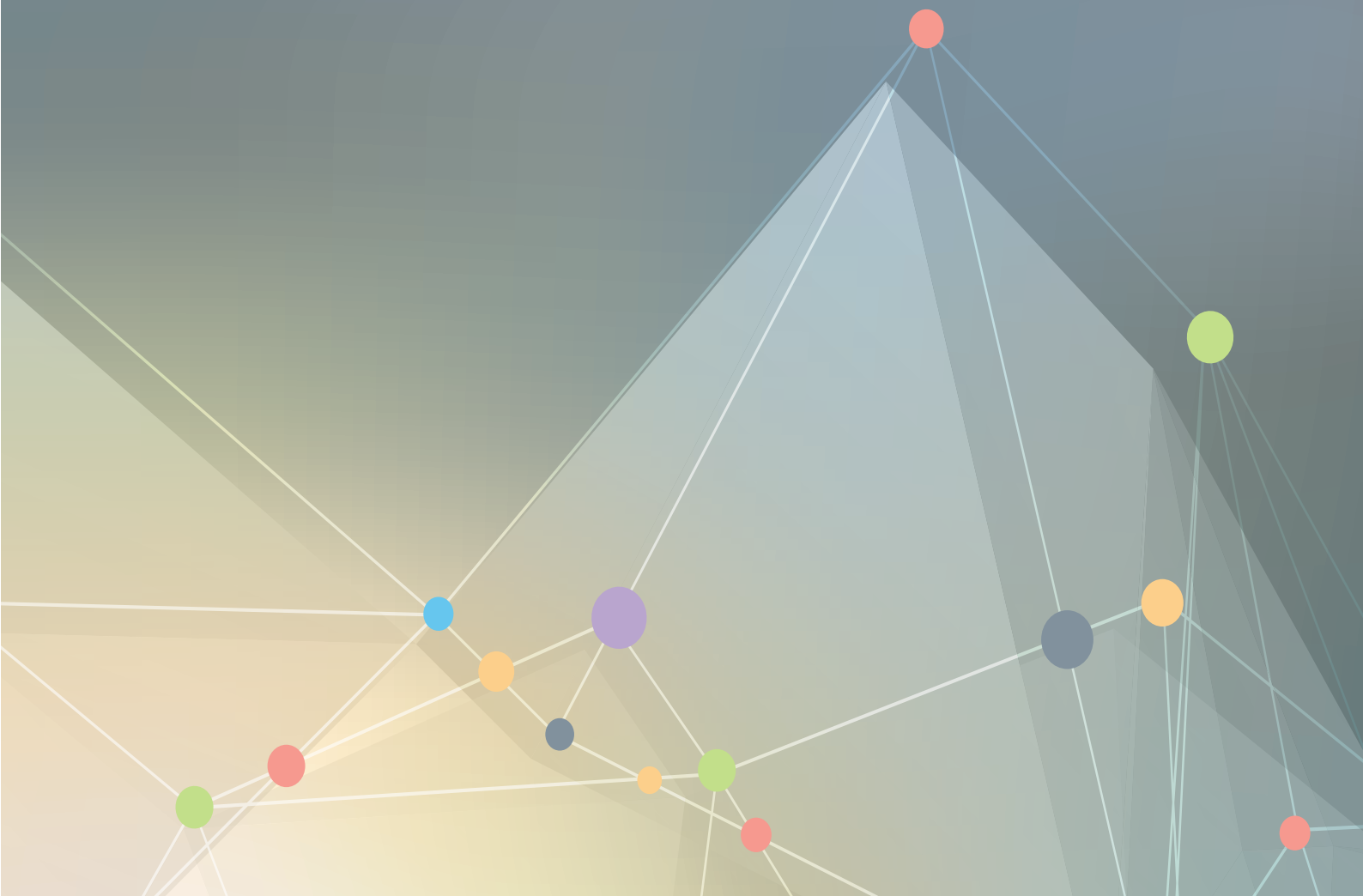
- These awards are dedicated to master's & PhD Students as well as Post-docs

17:00 **CLOSING SESSION**

Room 13/14 | Amphi 150 | Room 11/12 | Main amphitheater

SCIENTIFIC PROGRAM

List of Oral Presentations
&
List of Posters



List of Oral Presentations

Wednesday March 15th

08:00 Registration

09:00 OPENING SESSION MAIN AMPHITHEATER

Corinne CHANÉAC, Head of C'Nano (Sorbonne University – C'Nano)
David BABONNEAU, Local Coordinator & C'Nano North-Western board member (CNRS – Pprime)
Pascal BAIN, Head of the ANR SPICE department

09:30 PLENARY SESSION MAIN AMPHITHEATER

Laura NA LIU, University of Stuttgart – 2nd Physics Institute,
Functional DNA-based cytoskeletons for synthetic cell

10:30 Coffee & tea break

11:00 THEMATIC SESSIONS

NANOPHOTONICS & NANO-OPTICS

11:00	**Engineering Quantum States in 2D semiconductors**	**Bernhard URBASZEK** • *IPKM, Darmstadt – Germany*
11:30	Complete design of a fully integrated graphene-based compact plasmon coupler for the infrared	**Gilles RENVERSEZ** • *AMU - Inst. Fresnel, France*
11:45	A Chiral Inverse Faraday Effect Mediated by an Inverse-designed Plasmonic Antenna	**Ye MOU** • *Sorbonne Univ. - INSP, France*
12:00	Light Confinement in photonic moiré	**Chirine SAADI** • *EC Lyon - INL, France*
12:15	Digital harmonic holographic microscope for the study of nanostructures in nonlinear regime	**Serena GOLDMANN** • *CNRS - Inst. Langevin, France*
12:30	Excitation of a magnetic dipole transition through a plasmonic nano-antenna	**Benoit REYNIER** • *Sorbonne Univ. - INSP, France*
12:45	Super-resolution imaging of the formation of emitting sites for exciton localization in carbon nanotubes	**Benjamin LAMBERT** • *CNRS - LP2N, France*

13:00 Lunch, Posters session & Stand exhibition

NANOCHEMISTRY, NANOPARTICLES, NANOCATALYSIS

11:00	**Surface redox reactions for tuning the surface composition of bimetallic nanoparticles and their catalytic properties: the contribution of Poitiers catalysis laboratory**	**Catherine ESPECEL** • *Univ. Poitiers – IC2MP, Poitiers – France*
11:30	Cerium as a co-catalyst in nanostructured PGMs-based materials for glycerol oxidation in alkaline media: value-added products generation	**Fabiano DOS SANTOS CURSI** • *Univ. Sao Paulo - IC2MP, France*
11:45	Understanding the mechanisms involved in the formation of silicon particles from the thermal decomposition of hydrogen silsesquioxane: an in situ study by ETEM	**Cynthia CIBAKA NDAYA** • *CNRS - ICMCB, France*
12:00	Synthesis of nickel nanoparticles via an organometallic pathway	**Dimitri ROUBERT** • *Univ. Paul Sabatier Toulouse - LCC, France*
12:15	Green Synthesis of Water Splitting Electrocatalysts: IrO2 Nanocages via Pearson's Chemistry	**Jennifer PERON** • *Univ Paris Cité - ITODYS, France*
12:30	Nanostructured catalysts for the selective electro-conversion of bio-sourced molecules into value-added compound	**Thibault RAFAIDEEN** • *CNRS - IC2MP, France*
12:45	Core@Shell Co@CoS Nanorods on the Way to Magneto-Plasmonic Probes	**Thi Thiet VU** • *INSA Toulouse - LPCNO, France*

13:00 Lunch, Posters session & Stand exhibition

List of Oral Presentations

11:00 **THEMATIC SESSIONS**

FUNCTIONAL THIN FILMS & NANOSTRUCTURES: GROWTH & PROPERTIES

11:00	**Origin of the roughness of grain boundaries in 2D materials**	**Olivier PIERRE-LOUIS** • *CNRS – ILM, Lyon – France*
11:30	Kinetic Monte Carlo 3d model for Cu on Cu(001) homoepitaxy: from mounding at normal incidence to ripples orientation transition under GLAD conditions	**Florin NITA** • *Univ. Poitiers - Inst. Pprime, France*
11:45	Atomic scale investigation of deposition of low (W,Mo) vs. high (Ag,Cu) adatom mobility during first stages of silicide interface formation	**Cédric MASTAIL** • *Univ. Poitiers - Inst. Pprime, France*
12:00	Adatom thermomigration on a crystalline surface	**Aurélien ROUX** • *Univ. Paul Sabatier Toulouse - CEMES, France*
12:15	Growth and ferroelectricity of GeTe thin films on Si(111)	**Frédéric LEROY** • *AMU - CINaM, France*
12:30	Two-dimensional dynamic ordering of perylene on Ag(110)	**Laurent GUILLEMOT** • *CNRS - ISMO, France*
12:45	Topological Defects in Smectic A Liquid Crystal Thin Films studied by synchrotron GISAXS measurements	**Jean DE DIEU NIYONZIMA** • *Sorbonne Univ. - INSP, France*

13:00 **Lunch, Posters session & Stand exhibition**

2D MATERIALS

11:00	**2D Materials revealed by Angle-Resolved Photoemission Spectroscopy**	**Yannick FAGOT-REVURAT** • Univ. Lorraine – IJL, Nancy – France
11:30	Molecular adsorption on Dumbbell Silicene	**Laurita FLOREAN • Ye MOU** • *Sorbonne Univ. - INSP & LCPMR, France*
11:45	Visualizing In-Plane Junctions in Nitrogen-Doped Graphene	**Cyril CHACON** • *Univ Paris Cité - MPQ, France*
12:00	Propane/hydrogen CVD growth of graphene on SiC for applications	**Adrien MICHON** • *CNRS - CRHEA, France*
12:15	Quantum nanophotonics with 2D cristals	**Antoine RESERBAT-PLANTEY** • *CNRS - CRHEA, France*
12:30	Mechanical behavior and stability of 2D-Materials	**Michel DROUET** • *CNRS - Inst. Pprime*
12:45	Complete determination of thermoelectric and thermal properties of supported few layers 2D materials	**Mehrdad RAHIMI** • *Univ Paris Cité - MPQ, France*

13:00 **Lunch, Posters session & Stand exhibition**

14:30 **PLENARY SESSION** **LARGE AMPHITHEATER**

Guillaume SCHULL, CNRS – IPCMS, Strasbourg (France)-
Sub-molecular fluorescence microscopy with STM

List of Oral Presentations

15:30 **THEMATIC SESSIONS**

NANOPHOTONICS & NANO-OPTICS

15:30	**Playing with plasmons, molecules or dielectric nanoparticles to control light emission at the nanoscale**	**Celine FIORINI** • CEA – SPEC, Saclay – France
16:00	FRET-mediated collective blinking of self-assembled stacks of semiconducting nanoplatelets	**Laurent COOLEN** • *Sorbonne Univ. - INSP, France*
16:15	Nanophotonic structures by photopolymerization of functional inks	**Ludovic BELHOMME** • *Univ. Bordeaux - ICMCB/ CRPP, France*
16:30	Towards an electrically injected optical parametric oscillator	**Andrea GERINI** • *Univ Paris Cité - MPQ, France*
17:15	Excitability in a PhC nanolaser with an integrated saturable absorber	**Bruno GARBIN** • *C2N, France*
17:30	Time-Scale Dependent Thermo-Optical Coefficient in Titanium Dioxide Waveguides	**Jean-Claude WEEBER** • *Univ. Bourgogne - ICB, France*
17:45	Plasmo-electronic effects in self-organised gold nanoparticles	**Jérémie GRISOLIA** • *INSA Toulouse - LPCNO, France*

18:30 **Nanopitch** **Main Amphitheater**

19:30 **Cocktail Dinner, Posters & Stands Exhibition**

NANOMECHANICS

15:30	**Nanomechanics: Playing the nanoguitar to explore the dynamics of harmonic oscillators and two-level systems**	**Eva Maria WEIG** • *Technical University of Munich – Chair of Nano & Quantum Sensors, Munich – Germany*
16:00	Multifrequency-AFM platform for chemical and local property analysis	**Eric LESNIEWSKA** • *Univ. Bourgogne - ICB, France*
16:15	Elastic study of self-suspended nanowires by pump-probe spectroscopy	**Laurent BELLIARD** • *Sorbonne Univ. - INSP, France*
16:30	Plasmo-electronic effects in self-organised gold nanoparticles strain gauges	**Jérémie GRISOLIA** • *INSA Toulouse - LPCNO, France*
16:45	Coffee & tea break	
17:15	Nanomechanical characterization by AFM of a composite material: method and analysis	**Rosine COQ GERMANICUS** • *Univ. Caen Normandie - CRISMAT, France*
17:30	Small-scale experimental techniques to study thin film delamination	**Alice LASSNIG** • *Austrian Academy of Sciences. - ESI, Austrian*

18:30 **Nanopitch** **Main Amphitheater**

19:30 **Cocktail Dinner, Posters & Stands Exhibition**

List of Oral Presentations

15:30 **THEMATIC SESSIONS**

NANOBIOSCIENCES

15:30	**Bio-inspired compartments based on liquid-liquid phase separation**	**Nicolas MARTIN** • *CNRS – CRPP, Bordeaux – France*
16:00	From the "Ouzo effect" to the chemoradiotherapy : elaboration of hybrid nanocapsules for encapsulation and therapy	**Déborah IGLICKI** • *Univ. Rennes - ISCR, France*
16:15	Lipid-based nanodrugs in complex biological media: structure, corona formation and disassembly mechanisms	**Frédéric GOBEAUX** • *CNRS - NIMBE, France*
16:30	Organization of collagen I fibers and tissue hardening: markers of fibrotic scarring after spinal cord injury in mice revealed by multiphoton-atomic force microscopy imaging	**Oscar SAAVEDRA-VILLANUEVA** • *Univ. Montpellier - L2C, France*
16:45	Coffee break	
17:15	Self-assembly of shape-complementary DNA origamis for lithographic applications	**Nicolas TRIOMPHE** • *CEA - CBS, France*
17:30	Tissue / Organ-Selective Non-Viral Intracellular Drug-Delivery	**Peter DALKO** • *CNRS - LCBPT, France*
17:45	Aryl diazonium salts encoded plasmonic nanoparticles for multiplex color Raman imaging	**Da LI** • *Univ. Paris Cité - LCBPT, France*

18:30 **Nanopitch**

19:30 **Cocktail Dinner, Posters & Stands Exhib**

NANOELECTRONICS

15:30	**Enabling full fault tolerant quantum computing with silicon based VLSI technologies**	**Maud VINET** • *SiQuance, Grenoble – France)*
16:00	Leveraging Physics for Energy-Efficient Artificial Intelligence	**Damien QUERLIOZ*** • *CNRS - C2N, France*
16:45	Coffee & tea break	
17:15	Localised growth of Vertical GaN devices on large diameter silicon substrates	**Matthew CHARLES*** • *CEA - LETI, France*
17:45	Large Scale Integration of 2D material for RF switches	**Clotilde LIGAUD*** • *CEA - LETI, France*

* Invited speakers

18:30 **Nanopitch** **Main Amphitheater**

19:30 **Cocktail Dinner, Posters & Stands Exhibition**

List of Oral Presentations

Thursday March 16th

08:30 **PLENARY SESSION** **MAIN AMPHITHEATER**

Chantal PICHON, University of Orléans – CBM, Orléans (France),
Messenger RNA, a game changer in biomedicine: currents status, opportunities and challenges

09:30 **Sponsors & Partners presentation**

- **Renatech + PEPR Electronics**
- **EUR Nano-PHOT**
- **EUR INTree**
- **NKT Photonics**

10:00 Coffee & tea break

10:30 **THEMATIC SESSIONS**

NANOMECHANICS

10:30	**Single and multilayer electro-mechanical behavior studied with in-situ methods**	**Megan CORDILL** • *ESI – ÖAW, Leoben – Autriche*
11:00	Mechanical properties of a thickness controlled multi-layered copper thin film	**Szilvia KALACSKA** • *CNRS - LGF, France*
11:15	Nanoengineering the glassy state: toward novel thin film metallic glasses with outstanding combination of mechanical properties	**Matteo GHIDELLI** • *CNRS - LSPM, France*
11:30	Influence of ALD interlayers on mechanical and interfacial properties of Al thin films on polyimide	**Johanna BYLOFF** • *ETH Zurich - EMPA, Suisse*
11:45	Link between cracking mechanisms of trilayer films on flexible substrates and electro-mechanical reliability under biaxial loading	**Shuhel ALTAF HUSAIN** • *CNRS - LSPM, France*
12:00	Mechanical properties of realistic nanoporous gold ultra-thin film for flexible electronics, investigated by Molecular dynamics simulations	**Gwénaël MASSE** • *Univ.Poitiers - Inst. Pprime, France*
12:15	Nanoparticle morphology and stress evolution in metallic nanocomposite thin films produced by combined gas phase aggregation and magnetron sputtering	**Barbara PUTZ** • *ETH Zurich - EMPA, Suisse*

12:30 **Lunch, Posters session & Stands Exhibition**

NANOCHEMISTRY, NANOPARTICLES, NANOCATALYSIS

10:30	**Predicting realistic shape and structure of nano-catalysts under working conditions: Are we there ?**	**Hazar GUESMI** • *CNRS – ICGM, Montpellier – France*
11:00	Ab-initio study of the properties of metal-oxide nanoparticles: the case of ZrO2	**Ravikant KUMAR** • *Univ. Limoges - IRCER, France*
11:15	Towards DNA-coated patchy silica nanoparticles for programmable self-assembly	**Auriane BAGUR** • *Univ. Bordeaux - ICMCB/CRPP, France*
11:30	Elaboration of plasmonic enantiomorphs	**Nada KHALFAOUI HASSANI** • *Sorbonne Univ. - MONARIS, France*
11:45	Rate-limiting chemical reactions as the origin of non-classical nucleation in some co-precipitated compounds: the case of YbVO4	**David CARRIERE**• *CEA - NIMBE, France*
12:00	Chemical nanowelding of Cu@Ni bimetallic nanowires for transparent electrodes in room conditions	**Andela KRIZAN**• *Univ.Bordeaux - ICMCB, France*
12:15	Copper, Silicon, Phosphorus: new ternary nanocrystals for electrocatalysis	**Anissa GHORIDI** • *CNRS - LCMCP, France*

12:30 **Lunch, Posters session & Stands Exhibition**

List of Oral Presentations

10:30 **THEMATIC SESSIONS**

NANOBIOSCIENCES

10:30	**Nanodroplets to study crystallization and jellification phenomena using dropletbased microfluidics**	**Nadine CANDONI** • *AMU – CINaM, Marseille – France*
11:00	Design and performances of a 3D designed microfluidic cell for LSPR biosensing: A proof of concept study toward rapid bio-detection of pathogen targets	**Walid AIT MAMMAR** • *Sorbonne Univ. - LRS, France*
11:15	Nanoscale dynamic localization of single nanoparticles over an extended thickness at depth in complex (bio)environments	**Quentin GRESIL**• *CNRS - LP2N, France*
11:30	QD vs. organic dye in FRET biosensors: which one would you chose?	**Chloé GRAZON** • *CNRS - ISM, France*
11:45	Synthesis of hybrid nanoparticles to target extracellular vesicles	**Mélanie ROMAIN** • *Univ.Bourgogne - ICB, France*
12:00	Quantum dots micropatterning: towards biofunctionalization and nano-imaging	**Cyrille VEZY** • *UTT - L2n, France*
12:15	Use of core-satellite polymer-metal nanocomposites to remodel the tumor microenvironment of pancreatic cancer via combined therapies	**Jordan ROBERT** • *Univ. Montréal - GRSTB, Montréal*

12:30 **Lunch, Posters session & Stands Exhibition**

2D MATERIALS

10:30	**Order-disorder in water confined in natural swelling clays**	**Eric FERRAGE** • CNRS – IC2MP, Poitiers – France
11:00	Controlled friction at the solid-liquid interface in graphene-based nanochannels	**Sandra VASILIJEVIĆ** • *CNRS - LPENS, France*
11:15	From Biomass Wastes toward Gram-Scale Luminescent Graphene Quantum Dots	**Jean-Jacques GAUMET** • *Univ. Lorraine - LCP/A2MC, France*
11:30	On-surface assemblies of DNA-decorated functional nano-objects by supramolecular recognition	**Zohreh SAFARZADEH** • *Sorbonne Univ. - MONARIS, France*
11:45	Synthesis, characterization and surface chemistry of 2D Mo/Ti solid solution based MXene. Application to hydrogen evolution reaction in alkaline media	**Lola LOUPIAS** • *Univ. Poitiers - IC2MP, France*
12:00	Probing in situ the reactivity in molten salts of carbides and borides: synthesis of layered compounds, etching, and tuning of their composition	**David PORTEHAULT** • *CNRS - LCMCP, France*
12:15	Tuning the optical and electrical properties of 2D Ti3C2Tx MXenes: an ion implantation approach	**Ayoub BENMOUMEN** • *Univ.Poitiers - Inst. Pprime, France*

12:30 **Lunch, Posters session & Stand exhibition**

14:30 **PLENARY SESSION** **MAIN AMPHITHEATER**

Sarah BENCHABANE-GAIFFE, CNRS – FEMTO-ST, Besançon (France)-
Surface acoustic wave-driven mechanical resonators for phononic circuitry

List of Oral Presentations

15:30 **THEMATIC SESSIONS**

NANOPHOTONICS & NANO-OPTICS

15:30	**Predicting and designing the visual appearance of macroscopic nanostructured surfaces**	**Kevin VYNCK** • CNRS – ILM, Lyon – France
16:00	Mechanisms and applications of laser-induced self-organization in plasmonic quasi-random metasurfaces	**Nathalie DESTOUCHES** • *Univ. Jean MONNET - LabHC, France*
16:15	The iridescence of disordered resonant metasurfaces	**Adrian AGREDA** • *Univ. Bordeaux- LP2N, France*
16:30	Multiresonant behavior and strong coupling in aluminum optical antennas	**Davy GÉRARD** • *UTT - L2n, France*
16:45	Nanostructuration of Hybrid Organic-Inorganic Perovskite to tailor light-matter interactions for optoelectronic devices	**Nguyen Ha My DANG** • *CNRS - INL, France*
17:00	Coffee & tea break	
17:30	Fine structure of excitons and their interactions with phonons in single CsPbCl3 nanocrystals	**Victor GUILLOUX** • *Sorbonne Univ.- INSP, France*
17:45	Controlling giant polarisation rotation in the Poincaré sphere with a single quantum dot spin	**Elham MEHDI** • *Univ. Paris Cité - C2N, France*
18:00	Thermopolymerization induced by thermoplasmonics	**Olivier SOPPERA** • *CNRS - IS2M, France*
18:15	Local and Deterministic Integration of Luminescent Nanostructures on Photonic integrated circuits	**Abdelrahman ABDELAAL** • *UTT - L2n, France*

19:00 **PhD Awards Ceremony** **Main amphitheater**

NANOCHEMISTRY, NANOPARTICLES, NANOCATALYSIS

15:30	**Engineering Nanodiamonds from Gas Phase or Solution: Applications in Ammonia and Dihydrogen Sensing and Catalysis**	**Jean-Cyrille HIERSO** • *Univ. Bourgogne – ICMUB, Dijon – France*
16:00	Green synthesis of Gd3+-doped ultrasmall carbon-based nanohybrids from coffee wastes	**Kostiantyn PALIIENKO** • *Univ. Kyiv- ILM, France*
16:15	Elaboration of new hybrid perovskite@graphite composites and mixed 2D perovskites with enhanced stability for X-ray detection via a solvent-free mechanochemical approach	**Yihui CAI** • *Univ. Strasbourg - ICPEES, France*
16:30	Emulsions de Pickering stabilisées par un nanotubes aluminosilicaté Janus : propagation d'un front d'huile dans un réseau gelifié d'imogolites hybrides	**Estelle PUEL** • *CEA - NIMBE, France*
16:45	Coffee & tea break	
17:15	Ultra-small colloidal rare-earth aluminium/gallium garnet nanoparticles that are seed-mediate-grown beyond the surface of the YAG seed nanoparticles	**Yige YAN** • *ENS Lyon - LCH, France*
17:30	The effect of metallic precursors in the synthesis of metal nanoparticles at the liquid/liquid interface in Ouzo emulsions towards their use in catalytic hydrolysis of amine-boranes	**Olivier GAZIL** • *Polytechnique Montréal - ISCR, France*
17:45	Role of water in self-assembly of colloidal CdSe nanoplatelets	**Benoit WAGNON** • *CNRS - Lab. Chemistry, France*
18:00	Phosphate ions interactions with TiO2 nanoparticles: effect of the shape, crystallinity and oxidative stress	**Rémi BÉRARD** • *CEA - NIMBE, France*
18:15	Continuous Anisotropic Growth of NIR-Plasmonic CsxWO3-y Nanocrystals	**Jisoo OH** • *Ecole Polytechnique - PMC, France*

19:00 **PhD Awards Ceremony** **Main amphitheater**

List of Oral Presentations

15:30 **THEMATIC SESSIONS**

NANOBIOSCIENCES

15:30	**Translation to the clinic of an ultrasmall nanoparticle for treatment of cancer in combination with radiotherapy**	**François LUX** • Univ. Claude Bernard – ILM, Lyon – France
16:00	Biocompatible oily ferrofluid for better thermal tumor ablation efficiency	**Clément VECCO GARDA** • *CNRS - ICMCB, France*
16:15	Design of Iron Oxide Nanoparticles for imaging and active targeting: theranostic in one formulation	**Maria DE LOS ANGELES RAMIREZ** • *Univ. Strasbourg - IPCMS, France*
16:30	Impact of shape and defects of Iron Oxide Nanoparticles on photothermia and magnetic hyperthermia therapies	**Sylvie BEGIN COLIN** • *Univ. Strasbourg - IPCMS, France*
16:45	Synthesis, Characterization and Cellular Internalization of Anisotropic Magnetic Nanoparticles	**Jean-Michel SIAUGUE** • *Sorbonne Univ. - PHENIX, France*
17:00	Coffee & tea break	
17:30	Targeted thermal or mechanical Nanotherapy of pancreatic adenocarcinoma: efficacy and mechanisms	**Loubna LAIB** • *INSA Toulouse - LPCNO, France*
17:45	Bioimaging with persistent luminescence nanoparticles	**Cyrille RICHARD** • *CNRS. - UTCBS, France*
18:00	Luminescence nanothermometry for the control and understanding of heat-induced process and the fate of nanothermometers in vitro and in vivo	**Mahshid HASHEMKHANI** • *Univ. Paris Cité - MSC, France*
18:15	Synthesis & Functionalization of Hybrid Plasmon-semiconductor Nanoparticles for Cancer Photodynamic Therapy	**Thomas PONS** • *INSERM - LPEM, France*

19:00 **PhD Awards Ceremony** **Main amphitheater**

FUNCTIONAL THIN FILMS & NANOSTRUCTURES: GROWTH & PROPERTIES

15:30	**Unveiling the growth pathways of manganese germanides and silicides**	**Lisa MICHEZ** • *AMU – CINaM, Marseille – France*
16:00	Effect of O2 addition on the film growth mechanism of sputtered Ag thin films	**Ramiro ZAPATA** • *SGPM RECHERCHES - INSP/SVI, France*
16:15	Real-time study of ultrathin Ag growth: role of additives	**Grégory ABADIAS** • *Univ.Poitiers - Inst. Pprime, France*
16:30	Microstructure behavior of nitride-based multilayer coatings under He ion irradiation	**Nicolas SÉNICOURT** • *Univ.Poitiers - Inst. Pprime, France*
16:45	Innovative process of micro-nanostructure of titanium nitride (TiN) by association of a photostructurable titanium oxide (TiO2) and a rapid thermal annealing (RTA)	**Victor VALLEJO-OTERO** • *Univ. Jean Monnet - LabHC, France*
17:00	Coffee & tea break	
17:30	Growth of Metallic Nanostructures Embedded in Dielectrics for Quantitative Surface-Enhanced Raman Spectroscopy	**Emmanuel DE LOS SANTOS VAZQUEZ** • *Univ. Nantes - IMN, France*
17:45	From Chemical Solution Processes to Transparent Nanostructured Thin Films: Oxide Nanocrystals or Octahedral Metal Atom Clusters	**Fabien GRASSET** • *CNRS - ISCR, France*
18:00	Tio2 and ti-cu-o thin films deposited by aa-mocvd for marine antibiofouling applications	**Lisa DEBLOCK** • *CNRS - LMGP, France*
18:15	Recrystallization of thin 4H-SiC films deposited by PVD techniques, a way for new emerging fields	**Enora VUILLERMET** • *UTT - L2n, France*

19:00 **PhD Awards Ceremony** **Main amphitheater**

List of Oral Presentations

Friday March 17th

09:00 **PLENARY SESSION** **MAIN AMPHITHEATER**

Eric COLLET, University of Rennes 1 – IPR, Rennes (France),
Ultrafast control of materials down to nanoscale

10:00 Coffee & tea break

10:30 **THEMATIC SESSIONS**

NANOSCALE HEAT TRANSFER - MEASUREMENT

10:30	**Measuring temperature dependent optical indexes by spectroscopic ellipsometry**	**Simon HURAND** • *Univ. Poitiers – PPrime, Poitiers – France*
11:00	A sensor for manipulation of heat carried by phonons at the nanoscale and very low temperature	**Boris BRISUDA** • *CNRS - Inst. NEEL, France*
11:15	Electrothermal measurements on nanolayered structures by means of 3-omega method and Scanning Thermal Microscopy	**Carlos ACOSTA** • *CNRS - CETHIL, France*
11:30	Highly sensitive thermal niobium nitride nanoprobe for scanning thermal microscopy	**Olivier BOURGEOIS** • *CNRS - Inst. NEEL, France*
11:45	Synthesis of Au-Ag nano-hybrids to investigate heat transfer	**Clément VECCO-GARDA** • *CNRS - ICMCB, France*
12:00	Nanostructure thermal measurement: heat conduction within a single nanowire	**Séverine GOMÈS** • *CNRS - CETHIL, France*
12:15	Elaboration of perovskite thin films with metal-insulator transition for infrared optical modulation	**Arthur TAUSCH** • *Univ. Poitiers - Inst. Pprime, France*

12:30 **Lunch, Posters session & Stands Exhibition**

NANOMATERIALS FOR ENERGY

10:30	**Electrocatalysis of the oxygen evolution reaction by transition metal oxide nanoparticles**	**Elena SAVINOVA** • *Univ. Strasbourg – ICPEES, Strasbourg – France*
11:00	Active and Stable NiFe Catalysts supported on TiOx species for Oxygen Evolution Reaction (OER) in alkaline medium	**Victor RAUD** • *Univ. Poitiers - IC2MP, France*
11:15	Composite Mn-Co electrode materials for supercapacitors: Why the precursor's morphology matters !	**Ronan INVERNIZZI** • *Univ. Bordeaux - ICMCB, France*
11:30	Nanostructured WO3 as photoelectrocatalyst for the selective glycerol valorization	**Jesus GONZALEZ COBOS** • *CNRS - IRCELYON, France*
11:45	Characterization of a Kinetic Energy Harvesting System based on Selective Ion Sweeping using Photoluminescent Nanorods	**Lilian MAGERMANS**• *Ecole Polytechnique - LPMC, France*
12:00	Tunable dimensions of ZnO nanowires grown by metal-organic chemical vapor deposition and its impact on the physical and piezoelectric properties	**Lisa LEGARDINIER** • *Grenoble INP - LMGP, France*

12:15

12:30 **Lunch, Posters session & Stands Exhibition**

List of Oral Presentations

10:30 **THEMATIC SESSIONS**

NANOTECHNOLOGY FOR CLEANING ENVIRONMENT

10:30	**Unravelling the critical role of surface hydroxyls in the total oxidation of formaldehyde : case of silica-supported Pt nanoparticles and birnessite-type MnO2 catalysts**	**Jean-François LAMONIER** • *Univ. Lille – UCCS, Lille – France*
11:00	Mesostructured ZrO2-CeO2 catalysts for total degradation of VOCs	**Jean-Luc BLIN** • *Univ. Lorraine - L2CM, France*
11:15	Grafting photocatalytic metal oxides (ZnO, TiO2) on mesoporous silica via metalorganic route for air depollution	**Ons EL ATTI** • *Univ. Toulouse Paul Sabatier - LCC, France*
11:30	Synthesis and characterization of high surface CaTi1-xFexO3-δ (0	**Xavier COURTOIS** • *Univ.Poitiers - IC2MP, France*
11:45	Ton-scale synthesis of ZnO-based nanosuspension for industrial environnemental applications	**Stéphane DANIELE** • *Univ. Claude Bernard - CP2M, France*
12:00	Optimal architecture for enhancing the photocatalytic activity of ZnO nanowire arrays using a direct comparison with ZnO single crystals	**Adrien BAILLARD** • *Grenoble INP - LMGP, France*
12:15	Some factors affecting the photocatalytic effect of CeO2	**Damir MAMEDOV** • *Univ. Poitiers - IC2MP, France*

12:30 **Lunch, Posters session & Stands Exhibition**

SESSION INNOVATION

10:30	**Experience feedback**	**François JEROME** • *CNRS – IC2MP/INCREASE, Poitiers – France*
11:00	ROUNDTABLE : How to stimulating innovation and partnership between academic laboraties and industrials ?	**Thomas ROGAUME** • *Vice president of Poitiers University, in charge of Research, Innovation & economic partnerships* **François JEROME** • *CNRS - IC2MP, Director of INCREASE international consortium* **Cyril DUPEYRAT** • *Safran Electronics & Defense* & **Fabien PAUMIER** *Univ. Poitiers - Pprime, Dir. LabCom PRIMEO* **Matthieu GABARD** • *Dir. of Technopole Grand Poitiers support center, France* **Cédric LEBAILLY** • *CNRS - SPVR, Dir. of Partnership and Research Valorization Department, ENSMA, Univ. Poitiers, CNRS*

12:30 **Lunch, Posters session & Stands Exhibition**

14:00 **THEMATIC SESSIONS**

List of Oral Presentations

14:00 **THEMATIC SESSIONS**

NANOSCALE HEAT TRANSFER - MEASUREMENT

14:00	**Monte Carlo simulations of heat transport in nano-devices, a brief overview and recent developements**	**David LACROIX** • Univ. Lorraine – LEMTA, Nancy – France
14:30	Micro and nanoscale heat transfer investigation by 3D FEM for Scanning Thermal Microscopy	**Sarah DOURI** • *LNE - CETHIL, France*
14:45	Combination of thermal measurements and simulation to extract the hotspot temperature of GaN HEMT transistors	**Khalil KARRAME** • *Univ. Limoges - XLIM, France*
15:00	Full Band Ab-initio Monte Carlo simulation of phonon transport in GaAs nanostructures	**Junbum PARK** • *Paris-Saclay Univ. - C2N, France*
15:15	Passive nighttime radiative cooling with Black Silicon	**Armande HERVE** • *Univ. Gustave Eiffel - ESYCOM, France*
15:30	Investigation of nanostructured materials of topography free surface by Scanning Thermal microscopy	**Nathaly CHAARAOUI** • *Univ. Reims Champagne Ardennes - iTheMM, France*

15:45 Coffee & tea break

16:15 **Best Talks & Best Posters Award Ceremony**

16:45 **Closing Session**

NANOMATERIALS FOR ENERGY & 2D MATERIALS

14:00	**Tailoring nanomaterials for oxygen electrocatalysis**	**Aurélien HABRIOUX** • *Univ. Poitiers – IC2MP, Poitiers – France*
14:30	Thermally Stable W/TiAlN/TiAlSiN/TiAlSiON/TiAlSiO Selective Solar Absorber Nanofilms for Concentrated Solar Power	**Mireia SAINZ-MENCHÓN** • *Univ. Basque Country - UPV/EHU, Spain*
14:45	Mo2CTx MXene supported nickel-iron alloy heterostructure as efficient catalyst for: oxygen evolution reaction	**Roald BOULÉ** • *Univ.Poitiers - IC2MP, France*
15:00	Thin film of lanthanum cobaltite LaCoO3 for solar thermal collectors	**Abdoul Azise BANDE** • *Univ.Poitiers - Inst. Pprime, France*
15:15	Chemical reactivity of layered carbides and borides in molten salts: towards bidimensional MXenes and boridenes	**Emile DEFOY** • *CNRS - LCMCP, France*
15:30	The use of noble gas implantation to improve the thermoelectric properties of ScN and CrN thin films	**Hugo BOUTEILLER** • *Univ.Poitiers - Inst. Pprime, France*

15:45 Coffee & tea break

16:15 **Best Talks & Best Posters Award Ceremony**

16:45 **Closing session**

List of Oral Presentations

14:00 **THEMATIC SESSIONS**

NANOTECHNOLOGY FOR CLEANING ENVIRONMENT

14:00	**Degradation of Water Pollutants using Advanced Oxidation Processes: from laboratory to large scale case studies**	**Conchi O. ANIA** • CNRS – CEMHTI, Orléans – France
14:30	Graphitic carbon nitride/SmFeO3 composite Z-scheme photocatalyst with high visible light activity	**Bilel CHOUCHENE** • *CNRS - LRGP, France*
14:45	Photocatalytic activity of carbon/carbon heterojunctions for the degradation of emerging pollutants	**Tingwei SUN** • *China Scholarship Council - CEMHTI, France*
15:00	Design of magnetic graphene/iron oxide nanocomposites for efficient removal of toxic organic pollutants from water	**Joana VAZ-RAMOS** • *Univ. Strasbourg - ICPEES / IPCMS, France*
15:15	Functionalized Iron oxide for wastewater depollution	**Carolyne BYUN** • *Univ. Bourgogne - ICB, France*
15:30	Carbon dots-based composites: from elaboration to study of their properties for adsorption of pollutants	**Enrique MANSO CASTILLO** • *Univ. Paris Cité - MSC, France*

15:45 Coffee & tea break

16:15 **Best Talks & Best Posters Award Ceremony**

16:45 **Closing session**

NANOMECHANICS

14:00	**When more is less: the effect of grain boundaries on the mechanical properties of metal nanoparticles**	**Jonathan AMODEO** • *CNRS – IM2NP, Toulon – France*
14:30	Shape controlling mechanical properties in nanoparticles: from atomistic to continuous	**Matteo ERBI** • *ONERA - LEM, France*
14:45	Atomic Scale Simulations of {112} Symmetric Incoherent Twin Boundaries in Gold	**Yen Fred WOGUEM** • *Univ.Poitiers - Inst. Pprime, France*
15:00	Mechanical Properties of Si/SiC Nanoparticles using Finite Temperature Ab Initio Molecular Dynamics	**Laurent PIZZAGALLI** • *CNRS - Inst. Pprime, France*
15:15	Pyrough : a new tool to model rough samples in atomistic and finite element simulations	**Hugo ITENEY** • *CNRS - IM2NP,France*
15:30	Plasticity and strain-hardening of glassy polymers: a microscopic theory	**Didier LONG** • *CNRS - MatéiS, France*

15:45 Coffee & tea break

16:15 **Best Talks & Best Posters Award Ceremony**

16:45 **Closing session**

List of Poster Presentations

AREA - 1

A1 - NANOCHEMISTRY I NANOMATERIALS FOR ENERGY I CLEANING ENVIRONMENT I NANOBIOSCIENCES

A1-01	Development of Efficient Routes for the Synthesis of Alumina Supported Non-Noble Metal Nanoparticles	Abdennour BENABBAS • *CNRS - IC2MP, France*
A1-02	Ecologically efficient synthesis of heterogeneous catalysts via solvent-free reactive extrusion	Ryma HADDAD • *Sorbonne Univ. - LCMCP, France*
A1-03	Emulsion processing of gold nanoparticle shells: towards plasmonic nanoresonators	Mouktar NOUR MAHAMOUD • *CNRS - ISCR, France*
A1-04	Fvðrster resonance energy transfer between multicolor fluorescent carbon dots	Vladimir LYSENKO • *CNRS - ILM, France*
A1-05	Induction of chirality in semiconductor CdSe nanoplatelets	Guillaume LANDABURU • *CNRS - LCH, France*
A1-06	Influence of heteroelement addition on the properties of nanostructured titania	Jean-Luc BLIN • *Univ. of Lorraine - L2CM, France*
A1-07	Innovation for resolutive size distribution measurement of nanocarriers and bioconjugates in native state	Cédric SARRAZIN • *Nanoscale Metrix, France*
A1-08	LaPO4:Eu nanorods as polarized luminescence emitters and their application for in situ flow shear monitoring in an energy harvesting device	Lilian MAGERMANS • *EP - LPMC, France*
A1-09	Luminescence impact on green silver sulfide (Ag2S) nanothermometer with hydrogen peroxide (H2O2)	Thomas NAILLON • *Sorbonne Univ. - LCMCP, France*
A1-10	Micropore 3D graphenes: circumventing essential issues in large scale synthesis	Steven COMPERE • *Univ. Poitiers - IC2MP, France*
A1-11	New boron phosphide nanocrystals synthetized in molten salt	Amandine SENE • *CNRS - LCMCP, France*
A1-12	Optimization of a LSPR Sensor Chip Using Hollow Au Nanoparticles	Daoming SUN • *Sorbonne Univ. - LRS, France*
A1-13	Optimization of anisotropic LaPO4:Eu3+ nanorods as polarized luminescence probes in fluid flow	Qilin ZOU • *CNRS - LPMC, France*
A1-14	Reactivités chimiques entre les imogolites hybrides et une phase cimentaire : formulation d'une matrice de conditionnement pour la stabilisation des déchets nucléaires	Estelle PUEL • *CEA - NIMBE, France*
A1-15	Screening of nanoporous carbon electrodes for the electrochemical conversion of CO2 and N-compounds.	Ali FAYAD • *Univ. Orléans - CEMHTI, France*
A1-16	Structural disorder and vibrational properties of transition aluminas	Iñigo GONZALEZ DE ARRIETA • *Univ. Basque Country - CEMHTI, France*
A1-17	Studying dynamics of molecular layers covering gold nanostructures by SERS	Danilo OLIVEIRA DE SOUZA • *Univ. Lille - UCCS, France*
A1-18	Synthesis and Colloidal Stabilization of Manganese and Zinc Ferrite Magnetic Nanoparticles for failsafe Magnetocuring of resins	Naoures HMILI • *Sorbonne Univ. - LRS, France*
A1-19	Synthesis of Carbon Quantum Dots for Anti-counterfeiting	Théo DUARTE • *UTT - L2n, France*
A1-20	Synthesis of core-shell and nanoalloys from immiscible Cu and Co elements; application in dehydrogenation catalysis	Lorette SICARD • *Univ. Paris Cité - ITODYS, France*
A1-21	Synthesis of Mesoionic Carbene (MIC) Stabilized Gold Nanoparticles from 1,2,3-Triazolium Salts	Salem Saleh BA SOWID • *Sorbonne Univ. - LCMCP, France*
A1-22	Understanding the interactions in CuO-ZnO-ZrO2 catalyst	Ksenia PARKHOMENKO • *CNRS - ICPEES, France*
A1-23	Understanding the mechanisms involved in the formation of silicon particles from the thermal decomposition of hydrogen silsesquioxane: an in situ study by ETEM	Cynthia CIBAKA NDAYA • *CNRS - ICMCB, France*
A1-24	Using Mo(0) complex as highly reactive platform for the synthesis of molybdenum oxide nanoparticles under mild conditions	Martin JAKOOBI • *CNRS - LCC, France*
A1-25	Improving electrical contact of highly n-type doped 4H-SiC by Circular Transfer Length Method	Lazar MIHAI • *CNRS- L2n, France*
A1-26	Catalytic NOx treatment from hydrogen internal combustion engine	Amira BEN ATTIA • *CNRS - IC2MP, France*

List of Poster Presentations

AREA - 1

A1 - NANOCHEMISTRY I NANOMATERIALS FOR ENERGY I CLEANING ENVIRONMENT I NANOBIOSCIENCES

A1-27	Development and in vitro analysis of SPIO for theranostic purposes in cancer	Chloé GERVASONI • *SON SAS, France*
A1-28	DNA biodetection assay based on Whispering Gallery Mode Energy Transfer	Nour ALKASTNTINI • *ESPCI Paris /PSL - LPEM, France*
A1-29	Magneto-plasmonic biosensing: from benchtop spectrometer readout to 3D-printed microfluidic devices	Walid AIT MAMMAR • *Sorbonne Univ. - LRS, France*
A1-30	SPR Biosensor for the detection of micro-RNAs	Coline BELTRAMI • *Univ. Paris Saclay - LCF, France*

List of Poster Presentations

AREA - 2

A2 - NANOPHOT&NANOPTICS I NANOSCALE HEAT TRANSFER

A2-01	Advanced superstructures of nanoparticles in liquid crystal topological defects	Lamya ESSAOUI • *Sorbonne Univ. - INSP , France*
A2-02	Characterization of silicon vacancies in hexagonal silicon carbide formed by ion implantation of nitrogen and aluminum.	Enora VUILLERMET • *UTT - L2n, France*
A2-03	Controlling dichroism, diffraction and colors of nanomaterials with laser processing	Van Doan LE • *Univ. Lyon - Lab. Hubert Curien, France*
A2-04	Design and investigation of a low-threshold organic laser diode using mixed-order dfb cavities	Yara EL DROUBI • *Univ. Sorbonne Paris Nord - LPL, France*
A2-05	Design of metasurfaces by capillary assisted assembly of nanoparticles and their applications.	Juan XIN • *UTT - L2n, France*
A2-06	Facile InP/ZnS QDs encapsulation in MOF-5 matrices: towards solid state luminescence	Alexis TRAN • *Clermont Auvergne Univ. - ICCF, France*
A2-07	Full control of the electric and magnetic light-matter interactions through a plasmonic mirror on a near-field tip	Eric CHARRON • *Sorbonne Univ. - INSP, France*
A2-08	Hierachical structures of gold nanoparticules in topologica defects of smectic liquid crystals	Caterina TOSARELLI • *CNRS - INSP, France*
A2-09	Nanophotonic structures by photopolymerization of functional inks	Ludovic BELHOMME • *Univ. of Bordeaux - CRPP*
A2-10	Qualitative characterization of Au et Ag thin films by near-field optical microscopy	Valentin ALLARD • *Univ. Aix-Marseille - Fresnel Institute France*
A2-11	Room temperature synthesis of lead-free perovskite inspired manganese halides - from bulk to nano	Pierre MARTIN • *Clermont Auvergne Univ. ICCF, France*
A2-12	TERS Characterization of Functionalized Gold Nanostructure for Improved Biosensors.	Jean-François BRYCHE • *CNRS - LN2, France*
A2-13	Thermal management of VECSEL-GAAS for high-power single-mode emission	Abdelmounaim HAROURI • *CNRS - C2N*
A2-14	Ultrafast Direct Currents Generated by an Inverse-designed Plasmonic Antenna	Ye MOU • *Sorbonne Univ. - INSP, France,*
A2-15	Use of the OAD technique for high-efficiency nanostrutcured multilayer thin films polarizers	Etienne PANCHOUT • *CNRS - Pprime Inst., France*
A2-16	Impact of Ultra-thin-film Coatings on the Radiative Properties of Dual Functionality Black-Silicon	Elissa AKIKI • *Univ. Gustave Eiffel - ESYCOM, France*
A2-17	Nanoscale Heat Anisotropy in Gold Nanocrosses	Vega Marlo • *Univ. Sherbrooke - LN2, France*

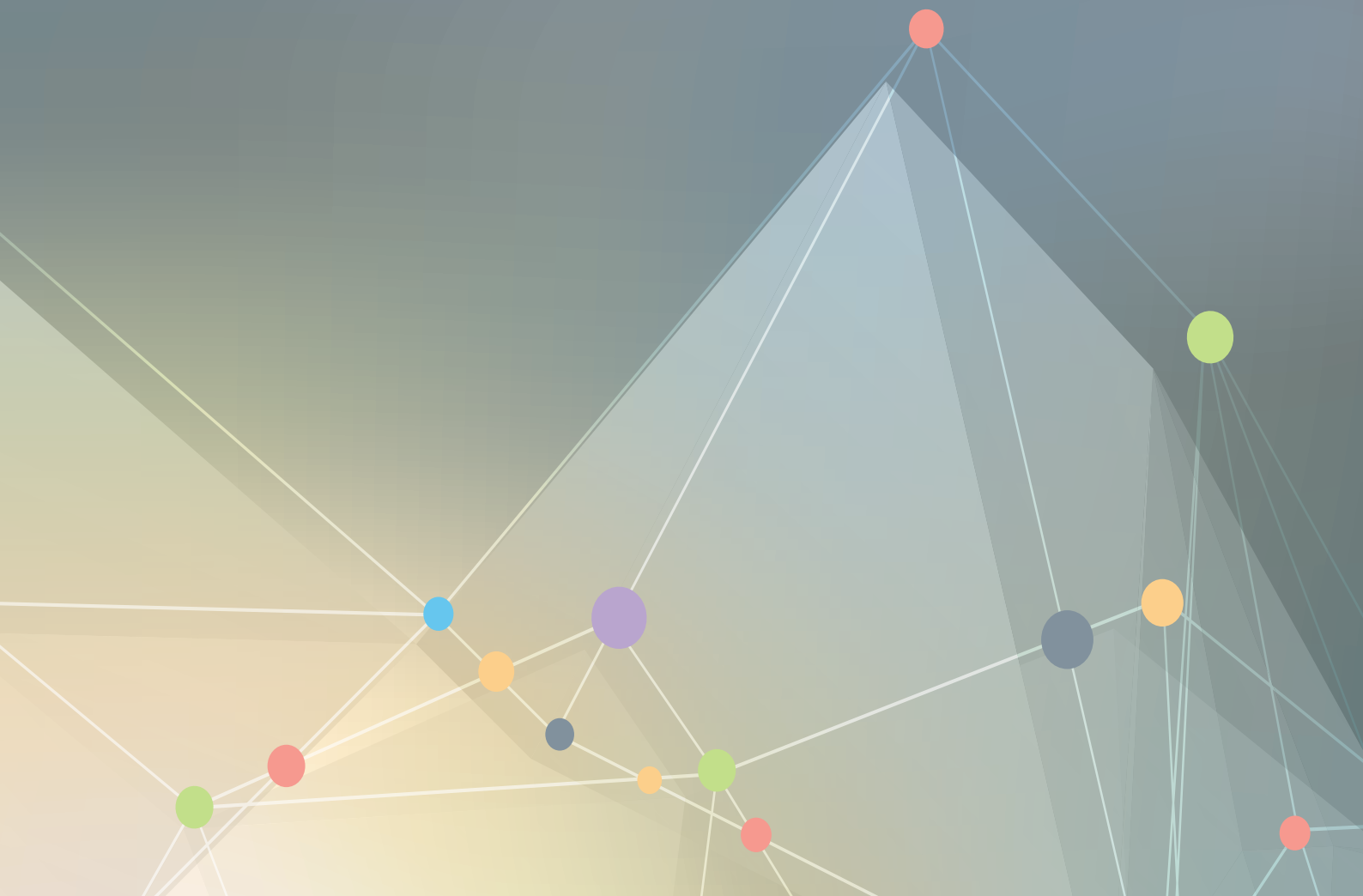
List of Poster Presentations

AREA - 3

A3 - THIN FILMS I 2D MATERIALS I NANOELECTRONICS I NANOMECHANICS

A3-1	Detachment of SiC thin films by thermal stress and Hydrogen implantation.	Yamina BENNOUR • *Univ. of Tizi Ouzou - CEMHTI, France*
A3-2	Elaboration of multiscale nanostructured luminescent coatings by combining ZnO nanowires and Y3Al5O12:Ce3+ luminescent coatings	Audrey POTDEVIN • *Clermont Auvergne INP - ICCF, France*
A3-3	From Noble Metal Plasmonic to Organic Plasmonic	Pierre BLETEAU • *Univ. Paris Cité - ITODYS, France*
A3-4	Growth and NMR study of high quality ordered Mn5(Six Ge1-x)3 thin films on Ge(111) substrate	Sueyeong KANG • *Aix Marseille Univ. - CINaM, France*
A3-5	Hexagonal Ge on self-assisted GaAs Nanowires in MBE	Juliia DUDKO • *EC Lyon - INL, France*
A3-6	Laser direct writing photoluminescent patterns from ZnO nanocristals	Olivier SOPPERA • *CNRS - IS2M / C'Nano EST, France*
A3-7	Picosecond dynamics of multipulse femtosecond laser-induced transformations in Ag/TiO2 nanocomposites	Balint ELES • *Employer - Jean Monnet Univ. LabHC, France*
A3-8	Plasmonic properties and structure evolution of Ag-Fe nanoparticles produced by lazer vaporization under reactive atmospheres	Julien RAMADE • *Univ. Poitiers - P' Institute, France*
A3-9	Plasmonics as a tool to reveal metal/dielectric adhesion at the nanoscale: application to buffer effect of transition metals	Rémi LAZZARI • *CNRS - INSP, France*
A3-10	Structural disorder in SrTiO3 based Ruddlesden-Popper phases	Clarisse FURGEAUD • *CNRS - INL, France*
A3-11	Structure of spin-crossover molecules ultra-thin films on Cu(110)	Amandine BELLEC • *CNRS - MPQ, France*
A3-12	Surface and interface structures of Al-Fe thin films: from metastable to high temperature phases	Julian LEDIEU • *CNRS - IJL, France*
A3-13	Thermal treatments effect about Al position and environment inside AZO thin films	Olivier KERIVEL• *Sorbonne Univ.INSP*
A3-14	Atomistic growth mechanisms of Xenes epitaxial layers revealed by in-situ scanning tunneling microscopy	Laurita FLOREAN • *Sorbonne Univ. - INSP & LCPMR, France*
A3-15	Correlative imaging of single graphene oxide flake: sample selection and limitations	Lydia CHIBANE • *LNE, France*
A3-16	Determination of the potential of the 2D transition metal carbides (MXenes) for the heterogeneous catalysis. Application to the hydrogenation reactions in gas phase and liquid phase.	Zheming LI • *Univ. Poitiers - IC2MP, France*
A3-17	Optical and electrical properties of titanium and molybdenum carbide 2D layers thin films	Sophia TANGUI • *Univ. Poitiers - P' Institute, France*
A3-18	ELENA: a European project for electrical nanoscale metrology in industry	Brice GAUTIER • *INSA Lyon - INL / C'Nano AURA, France*
A3-19	Atomic Scale Simulations of Twins ,Äi Interfaces Interaction in a Nanolamellar Ag/Cu System	Sandrine BROCHARD • *Univ. of Poitiers - P' Institute, France*
A3-20	Improved nanometric control of ions and electrons via laser ionization and coincident detection	Clelia BASTELICA • *CNRS - LAC, France*
A3-21	Load versus displacement controlled nanomechanics¬†: insights from atomistic simulations	Hugo ITENEY • *CNRS - IM2NP, France*
A3-22	Strain ratio and thickness effects on plasticity and cracking of nickel thin films	Pierre GODARD • *Univ. Poitiers - P' Institute, France*
A3-23	Study of the mechanical properties of polymers reinforced with nanoparticles of adjustable size,shape and surface chemistry	Sakina MEFTAH • *UTC - ROBERVAL/MONARIS, France*
A3-24	Synthesis of molecularly imprinted polymer-based hybrid nanosensors by optical near-field photopolymerization	Amine KHITOUS • *Haute-Alsace Univ. - IS2M, France*
A3-25	Towards an electrically driven high Q, GHz mechanical resonator for quantum information applications	Marie JOLY • *Sorbonne Univ. - INSP, France*

ABSTRACTS OF PLENARY SPEAKERS



Sarah BENCHABANE

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Biography

Sarah BENCHABANE graduated with an MSc in Optics and Optoelectronics from the University of Saint-Etienne in 2003 and a PhD in Engineering of the Université de Franche-Comté in Besançon in 2006. Her PhD thesis was dedicated to the study of guiding and filtering phenomena in phononic crystals. She subsequently undertook a post-doctoral research position at the Institut de Ciencies Fotoniques (ICFO) in Barcelona (Spain). Her work there mainly focused on lithium niobate integrated optoelectronic devices based on periodical poling. She was appointed a full-time researcher at FEMTO-ST in 2008. Since then, her research activities have mostly revolved around the investigation of elastic wave propagation and confinement in micro- and nano-structures. Her current interests lie in the investigation of electromechanical systems at the crossing of phononics, MEMS/NEMS and electro-acoustics for the development of classical and quantum information processing devices that can be used either in an independant fashion or as a basis for the investigation of strain-mediated coupling, most notably for optomechanics.

Surface acoustic wave-driven mechanical resonators for phononic circuitry

Guided elastic waves are powerful information carriers standing at the core of modern telecommunication devices. Surface acoustic waves (SAW), in particular, have been industrially used as radio-frequency filters or delay lines since the 1970s and remain relevant in all current connectivity standard technologies. More recently, the scope of their potential application fields has expanded covering fields as diverse as life science and quantum information technology [1]: SAWs are mechanical vibrations, and as such, can coherently couple to a number of physical systems. This intrinsic property has recently pushed towards the development of hybrid electromechanical or phonon-based devices. In this context, the implementation of scalable phononic circuits has become an appealing prospect in view of increasing the versatility of electro-acoustic devices. Recent demonstrations have made convincing steps towards this objective by proposing phononic architectures inspired by photonic integrated circuits [2] or combining the rich dynamics of micro- and nano-electromechanical (M/NEMS) resonators with propagating elastic waves [3].

Here, we propose to exploit the interaction between surface acoustic waves (SAW) and locally-resonant, micron-scale mechanical resonators in order to achieve coherent driving of the resonator motion with SAW and, reciprocally, to control the elastic energy distribution at a deep sub-wavelength scale. We investigate the proposed physical system both in the linear [4] and non-linear regimes [5] and reveal that the elastic field behavior can be further controlled through resonator-to-resonator coupling, leading to a variety of interaction schemes affecting both the frequency response and the polarization of the resonating structures. The proposed devices, that operate in the 70-MHz range, are readily scalable to higher frequencies. They illustrate the potential of SAW-based architectures for the implementation of densely integrated phononic circuits with complex dynamics operating at gigahertz frequencies.

Keywords

Photonics; Surface acoustic waves; Micro-nano-electromechanical systems

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Plenary Speakers

Eric COLLET

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Biography

Eric COLLET conducts research on photoinduced phase transitions in materials. He seeks to understand and control these mechanisms, using femtosecond laser pulses, by combining optical spectroscopy and ultra-fast structural analyzes with synchrotron and X-FEL. Such techniques make it possible to understand how functions emerge through the coupling between electronic excited state and structural relaxation, on the elementary time scales of electronic dynamics and atomic motions. He is interested in non-equilibrium mechanisms driven by light excitation and non-linear response and cooperative response of materials, where one photon can transform several molecules from microscopic to nanoscale.
Eric Collet is professor at University Rennes 1 and director of the International Research Laboratory DYNACOM with the University of Tokyo. He received the Ancel prize of the SFP (2018), the CNRS silver medal (2020), the Kalman prize of the ECA (2022). He is currently appointed as senior fundamental chair of the Institut Universitaire de France (2022-27).

Ultrafast control of materials down to nanoscale

The advent of control science for directing matter and energy represents an important challenge for material science, especially at nanoscale. Indeed, it is now possible to control materials by light for generating remarkable properties on ultrafast timescale (ferroelecticity, conductivity, magnetism, photochromism…) [1,2]. These result from complex couplings between electronic and atomic constituents of matter.
X-ray free electron lasers (X-FEL) open new possibilities for probing ultrafast photoinduced phenomena in order to disentangle, understand and control electronic and structural dynamics down to femtosecond timescale [3]. Ultrafast photoswitching in bistable molecular-based crystals is associated with a complex transformation pathway, multiscale in nature, where both molecular photo-switching (100 fs) and nanoscale elastic (ns) or thermal (µs) transformation of crystals play their role [4,5].
We have studied the basic mechanisms allowing light to switch molecular materials between different magnetic states, by using femtosecond x-ray diffraction & absorption and optical spectroscopy. The stabilization of the photoinduced magnetic state results from the activation and damping of a molecular breathing mode. We gained experimental insights of this process, beyond the Born–Oppenheimer approximation, by disentangling the electronic charge-transfer excitation from the structural trapping dynamics [6,7]. We have demonstrated that in the active crystalline medium cooperative elastic effects can drive self-amplified and coherent response to light excitation [4]. The self-amplification process results from the elastic field induced by light, coupled to the molecular volume change, allowing the transformation of several molecules from a single photon at nanoscale. This elastic dynamics scales with systems' sizes [8].

Keywords

Photoinduced phase transition; Ultrafast phenomena; out-of-equilibrium dynamics; Spectroscopies; Crystallography

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Plenary Speakers

Laura Na LIU

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Biography

Prof. Laura Na LIU received her Ph. D in Physics at University of Stuttgart, Germany. She then worked as a postdoctoral fellow at the University of California, Berkeley and as a Texas Instruments visiting professor at Rice University, respectively. Before she became a professor at the Kirchhoff Institute for Physics at University of Heidelberg in 2015, she had worked as an independent group leader at the Max-Planck Institute for Intelligent Systems. In 2020, she joined University of Stuttgart and became the Director of the 2. Physics Institute.

Functional DNA-based cytoskeletons for synthetic cell

Building synthetic cytoskeletons that mimic key features of their natural counterparts delineates a crucial step towards synthetic cells assembled from the bottom-up. To this end, DNA nanotechnology represents one of the most promising routes, given the inherent sequence specificity, addressability, and programmability of DNA. In this talk, we will present functional DNA-based cytoskeletons operating in microfluidic cell-sized compartments. The synthetic cytoskeletons consist of DNA tiles self-assembled into filament networks. These filaments can be rationally designed and controlled to imitate features of natural cytoskeletons.

Keywords

DNA nanotechnology; Nanochemistry; Cell mimics; Self-assembly; Nanobiosciences

Reference

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Chantal PICHON

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Biography

Chantal PICHON is Professor at the University of Orleans (France), senior member of the Institut Universitaire de France as Innovation chair laureate. She carries out her research activities at the Centre de Biophysique Moléculaire (Orléans) and coordinates the team Cellular Signaling, Molecular Targets and Innovative Therapies. C. Pichon is conducting interdisciplinary projects based on chemistry and molecular and cell biology with a crosstalk between basic and applied researches. Her main research activities are dedicated to the use of nucleic acids as therapeutics, especially messenger RNAs as vaccines and therapeutics. Her lab is developing innovative formulations for their delivery for various applications: mucosal vaccination, imune cell-based therapies and protein replacement therapy. She is also developping a challeging project to build an economically sustainable biotechnology process for production of high-quality mRNA therapeutics opening their use in different applications. C. Pichon has a track-record of 170 articles and 12 filled patents. She obtained 26 academic and private grants (Horizon Europe, FP7, ANR, Région, Ligue Nattionale contre le cancer…).

Messenger RNA, a game changer in biomedicine: currents status, opportunities and challenges

The perspective of using messenger RNA (mRNA) as a therapeutic molecule has first faced some uncertainties due to concerns about its instability and the feasibility of large-scale production. The potential of messenger RNA (mRNA)-based vaccines has been revealed by the success of rapid and adaptable vaccination strategies to fight against COVID-19 pandemic. The achievement of those mRNA vaccines has been made possible through advances in the design of mRNA structure, manufacturing and delivery systems. This success opens up an avenue for the development of innovative mRNA-based therapeutics and vaccines envisioning different applications in immunotherapy, regenerative medicine and gene editing. I will present the key milestones that have led to the production of these vaccines. Current knowledge regarding crucial aspects-structure, stability, formulations, cellular delivery and translation- and in vivo applications of mRNA will be summarized. Last, I will also present challenges that have to be tackled to fully prove its mettle and to potentiate mRNA therapeutic applications.

Keywords

Messenger RNA; mRNA formulations; Lipid nanoparticles; mRNA-based vaccine; Protein therapy

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Plenary Speakers

Guillaume SCHULL

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Biography

Guillaume SCHULL is a CNRS researcher at the IPCMS in Strasbourg. He is a specialist is scanning probe microscopy in combination with optics measurements. He has contributed to the developement of a novel experimental approach that uses electrons rather than photons as the source of excitation of molecules, and has demonstrated that it is possible to probe and control the fluorescence properties of single emitters with sub-nanometric resolution.

Sub-molecular fluorescence microscopy with STM

The electric current traversing the junction of a scanning tunneling microscope (STM) may lead to a local emission of light that can be used to generate sub-molecularly resolved fluorescence maps of individual molecules. Combined with spectral selection and time-correlated measurements, this hyper-resolved fluorescence microscopy approach allowed us to scrutinize the vibronic structure of individual molecules [1] in a very similar way than in the recent TERS reports, without requiring an optical excitation. We used this approach to characterize the photonics properties of charged species [2], to track the motion of hydrogen atoms within free-based phthalocyanine molecules [3], and more recently to follow resonance energy transfers between individual pigments, exploring processes occurring in photosynthetic complexes with sub-molecular spatial resolution [4].
These results constitute an important step towards photonic measurements with atoms-scale resolution [5].

Keywords

Single molecule fluorescence; Energy transfer; Electronic structure of atoms and molecules; Optoelectronics; Scanning tunneling spectroscopy

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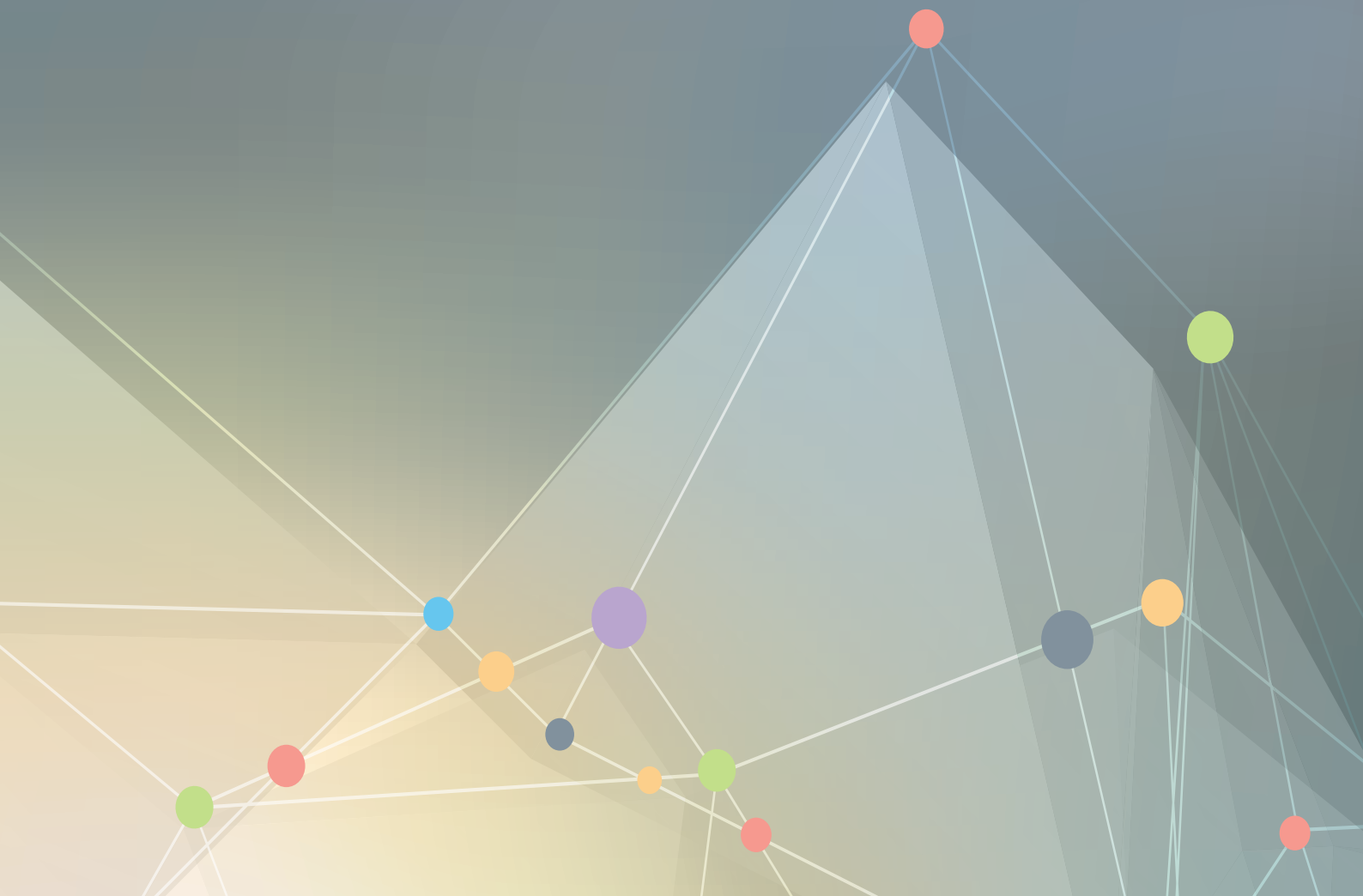
ABSTRACTS
OF
KEYNOTE SPEAKERS



Lisa MICHEZ

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Biography

Lisa MICHEZ carried out her PhD in the Condensed Matter at Leeds University, supervised by Bryan Hickey and Jim Morgan. From 2002 and 2005, she was a postdoctoral fellow with Christopher Marrows at Leeds University. In 2005, she joined the CRMCN lab at Aix-Marseille university as an assistant professor. She holds now a professorship at CINaM in the field of materials science and spintronics. She is the leader of the 'Si/Ge-based Heterostructures' team in the Nanomaterials department.
Her research activities are mainly focused on the study of the epitaxial growth of nanostructures and heterostructures based on Group-IV elements and their related structural, chemical and magnetic properties, in particular for spin injection into semiconductors. Since recently, she has been investigating the spin-to-charge conversion in unconventional antiferromagnetic materials.

Unveiling the growth pathways of manganese germanides and silicides

Silicon- or Germanium-based systems attract a great deal of attention due to their high compatibility with the mainstream technologies and the abundance of these elements in the earth crust. When alloyed with manganese, these compounds exhibit fascinating properties that are induced by their exotic magnetic structures [1-3].
We will focus here on the epitaxial growth of Mn5Si3 and Mn5Ge3 thin films on Si(111) and Ge(111), respectively. Both Mn5Si3 and Mn5Ge3 compounds crystallize in the hexagonal D88 structure (P63/mcm space group). Despite the similarities of the heterostructures in terms of crystal symmetry and lattice mismatch, the growth mechanisms in both systems are drastically different. Whereas the Mn5Ge3 growth on Ge(111) can be implemented using different techniques such as solid phase epitaxy [4] and reactive deposition epitaxy [5], there is no report to date on the formation of a sole Mn5Si3 thin film directly grown in epitaxy on Si(111). We will show how the growth pathways and the structural properties of the manganese silicides and germanides can be rationalized in terms of reactions maximizing the free-energy lowering rate [6-7]. In addition, different types of defects have been identified in these thin films. They play a central role in the phase formation and the film relaxation [8].
Interestingly, this D88 crystal structure contains two crystallographically independent sets of manganese atoms: Mn1 atoms, in the 4d-sites, form long chains parallel to the c-axis whereas Mn2 atoms occupy the 6g-positions in an octahedral arrangement. Such structures have a nearly unique ability to bind different heteroatoms in the preformed octahedral cavity formed by Mn2 atoms, which modifies profoundly their physical properties. As an example, the incorporation of C atoms in these specific positions leads to enhanced magnetic properties [4] while increasing the phase stability [8, 9]. Our works also evidence for a selective fulfillment of the available cavities by carbon, leading to a highly ordered superstructure [10].
In summary, these examples illustrate how molecular beam epitaxy can be used for the controlled growth of epitaxial films in the search of emerging materials for nanoscaled electronic and magnetic devices.

Keywords

Epitaxial growth; Mn compounds; Magnetic properties; Phase formation and stability

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Olivier PIERRE-LOUIS

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Biography

Olivier PIERRE-LOUIS is a CNRS Research Director at ILM Lyon. After a PhD in Grenoble and a postdoc at the Univ. of Maryland, College Park, he joined the CNRS in 1998 at Liphy in Grenoble. Since 2009, he develops his research activity at the Institut Lumière Matière in Lyon.
His theoretical research, initially oriented towards crystal growth and electromigration, now includes works in nanosciences, soft matter, biophysics and geophysics. Recently, he has been working on the dewetting of solid-state films, on the growth of nano-confined crystals, on adhesion and confinement of membranes (graphene and lipid bio-membranes), and on the control of the shape of nanoclusters by external fields.

Origin of the roughness of grain boundaries in 2D materials

Grain boundaries in 2D materials are formed by the collision of the edges of the 2D domains during growth. The roughness of these grain boundaries is relevant for the physical properties of 2D materials. This roughness emerges from statistical fluctuations and instabilities during growth. We have modeled these processes using Kinetic Monte Carlo simulations and Langevin models.

Our models suggest that the evolution of the roughness is non-monotonous. While it usually increases during the growth process, the roughness decreases during and after the collision of the edges. This decrease could be used to produce very smooth grain boundaries.

Keywords

Crystal growth; Grain boundaries; Roughness; 2D materials; Theory and Modeling

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Biography

Conchi O. ANIA She received her PhD degree in 2003 (Univ. Oviedo, Spain) and performed postdoctoral stays in USA and France. In 2009 she became Tenured Scientist at Agencia Estatal CSIC, and in 2017 she joined CNRS as Directrice de Recherche. She received the national L'Oreal-Unesco Research Fellowship "For women in Science" (2008) and the Excellence Research Award by Univ. Granada (2008). She is a grantee of the European Research Council (2016-22) and editor of Carbon journal (Elsevier) since 2022.
Current research interests focus on developing nanoporous materials for high-tech applications: water treatment (photo-/electrocatalysis), gas adsorption/separation, solar energy conversion. She is co-inventor of two patents (one transferred to industry for 2 years). She has an H-index of 47 with over 6000 citations.

Degradation of Water Pollutants using Advanced Oxidation Processes: from laboratory to large scale case studies

Current challenges in wastewater treatment are linked to the need for developing effective solutions to face emerging pollutants, capable of assuring a feasible economic upgrade of existing plants. Conventional biological treatments are assisted with tertiary processes such as adsorption on nanoporous adsorbents to improve the efficiency of the treatments, However, despite being mature technologies, the cost associated to the regeneration of the spent carbon (energy consumption, transportation) still represents a major limitation for massive implementation. On the other hand, advanced oxidation processes (e.g., based on electrochemical and photocatalytic approaches) have become an interesting alternative for the simultaneous removal and degradation of pollutants. Furthermore, when coupled with adsorption, they can also provide the on-site regeneration of the saturated adsorbents.
This communication will focus on some examples about the application of advanced electrochemicla and photocatalytic oxidation processes based on nanomaterials and renewable energies, for the degradation of emerging pollutants in water. Examples will cover our research activities at lab-scale, as well as various case studies at pilot scale on the application of these technologies and materials to wwasztewater from industrial and treatment plant facilities origins.
These research activities have received funding from the European Union's Horizon 2020 research and innovation program under the grant agreement Nº 776816, and Région Centre Val de Loire (grant MOSAIK).

Keywords

Nanoporous materials; water treatment; advanced oxidation processes; electrochemistry; photocatalysis

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Biography

Jean-François LAMONIER is a full Professor in Department of Chemistry and Deputy Director of the Laboratory "Unit of Catalysis and Solid State Chemistry". His research addresses the catalytic oxidation technologies for Volatile Organic Compounds emissions removal and the catalytic pyrolysis of plastic waste. His research comprises (i) the development of supported noble metal and transition metal oxide catalysts with emphasis in the elucidation of the structure-chemical properties and catalytic activity relationship and (ii) the coupling of abatement technologies such as non-thermal plasma and heterogeneous catalysis. For this last-mentioned topic Jean-François Lamonier heads the International Associated Laboratory "Plasma & Catalysis" between Lille University and Ghent University (Belgium). His research activity is documented in more than 140 refereed publications in international scientific journals.

Unravelling the critical role of surface hydroxyls in the total oxidation of formaldehyde : case of silica-supported Pt nanoparticles and birnessite-type MnO2 catalysts

Formaldehyde (HCHO) is a dominant indoor air pollutant, harmful to human health even at a very low concentration. Various approaches have been developed to reduce indoor HCHO pollution, among which the catalytic oxidation stands out since it is environmentally friendly and cost-effective [1]. Up to date, a variety of metal oxide and noble metal catalysts have been developed for HCHO total oxidation.

Among noble metal catalysts, Pt based catalysts stabilized by different supports (TiO2, CeO2, MnO2 …) have attracted much attention due to their excellent catalytic performance at room temperature [2]. Due to its irreducibility SiO2 has been considered as a poor support for low temperature HCHO oxidation. However the critical role of surface hydroxyls in the formaldehyde oxidation inspires the possibility to take advantage of the silanol groups of the silica as support for HCHO oxidation. Amoung metal oxide catalysts, birnessite-type MnO2 was recognized to be the most noble-metal-free catalyst active catalyst in HCHO oxidation and various strategies to improve the activity of MnO2 has been recently reported [3]. The hydrated alkali cations (Na+, K+) restricted in the interlayer region of the birnessite-type MnO2 are suspected to enhance the surface oxygen activity facilitating the regeneration of surface hydroxyls by activating H2O, present in the interlayer region [4].

In the first part of the lecture the results of the effect of the silanol content, in Pt/SiO2 with very low Pt loading, will be discussed through a rational design of the catalyst. The silanol content significantly affected the interaction behaviours of HCHO, H2O, CO and CO2 with the catalyst surface. The silanol-rich Pt/SiO2 even with low Pt loading is highly efficient in HCHO oxidation at room temperature under different humid conditions. In a second part, the results of the effect of the low Ce loading on birnessite-type MnO2 will be discussed as a function of the calcination temperature. The Ce incorporation and the calcination temperature allow the tuning of adsorbed/interspaced water, Mn3+/Mn4+ and Ce3+/Ce4+ atomic ratios. Many active oxygen and formation of active OH groups by adding water in the feed provide a very active and stable Ce-birnessite-type MnO2 catalyst in HCHO oxidation.

Keywords

Formaldehyde total oxidation; Pt NPs; Silica; Birnessite; OH

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Yannick FAGOT-REVURAT

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Biography

Yannick FAGOT-REVURAT has a professor position at the Lorraine University in Nancy (France) since 2012 and do his reasearch at the Institut Jean Lamour (IJL) in the Physics of Matter and Materials (P2M) department. He is now the leader of the Surfaces, Spectroscopies and Modelization research group. His main recent research has been carried out combining in situ Angle-Resolved Photoemission Spectroscopy (ARPES) and Scanning Tunneling Microscopy and Spectroscopy (STM/STS) in order to study the electronic structure of ultra-thin films and nanostructures. With his group he got recent results on electronic properties of organic/metal interfaces as well as of 2D oxides. He is in charge of a new spin-ARPES set-up installed on the IJL-TUBE-Daum connecting more than 20 UHV set-ups dedicated to elaboration (MBE, reactive MBE, PLD, PVD, ALD...) and characterization (MOKE, XPS, STM, STM-AFM, Spatially resolved AES...) of thin films and nanomaterials. He is an expert of using synchrotron radiation as a photon source for photoemission experiments.

2D Materials revealed by Angle-Resolved Photoemission Spectroscopy

On one hand, 2D materials are the subject of increasing research activity owing to their singular electronic/optical/magnetic properties (direct band gap, topological states and QSH effect, room temperature ferromagnetism...) and to the possibility to combine them in functionnal heterostructures [1,2]. On the other hand, Angle resolved Photoemission Spectroscopy (ARPES) is a powerfull tool to characterize band structure, spin-polarized band structure, band topology and finally intra/inter-layer coupling in Van der Waals materials. Bottom up synthesis (CVD, MBE...) as well as exfoliation and transfer strategies have been recently used to investigate the band structure of 2D Materials by various ARPES technics [3].

In a first part we will focus on three examples of our recent work :

- k-resolved ARPES was combined to local STS spectroscopy and DFT calculations in order to reveal on-surface synthesis of 1D polymers [4] and beyond, a 2D polymeric architecture presenting a Dirac cone as expected in such graphene-like materials [5];
- More recently, it has been shown that silicon and germanium oxides exist in their ultra-thin forms (monolayer and bilayer) when deposited on a pre-oxidized Ru(0001) substrate. In this case, the combination of ARPES and DFT calculations reveal a transition between a monolayer strongly coupled to the substrate whereas the bilayer is shown to be a transferable VdW material with a large band gap comparable to h-BN [6,7];
- Electronic properties of GeTe, synthetized on Si(111)-Sb and on graphene/SiC(0001) and known as a Ferroelectric Rashba material in its bulk form, has been studied as function of its thickness.

Circular dichroïsm in ARPES has been first used as an indirect evidence of the disappearence of ferroelectricity measuring the sign change of the Berry curvature in k-space. In addition, our spin-ARPES measurements on a 5 nm GeTe/Si(111)-Sb unambigously demonstrate a shift of spin-polarized bulk bands leading to a 100% spin-polarized Fermi surface [8-9].

In a second part, we will briefly shown recent nano [3] and in operando [10] ARPES measurements evidencing the possibility to get a spatially resolved band structure on 2D materials as well as on electronic devices with the capability to play with the band structure and control the electronic properties by tuning external parameters (doping, bias voltage...)

Keywords

ARPES on 2D Materials; ARPES on 1D, 2D polymers at surface; ARPES on 2D Oxides; CD-ARPES and spin-ARPES on GeTe ultrathin films; Nano and in operando ARPES

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Biography

Eric FERRAGE obtained his PhD in 2004 from the University of Grenoble (France). He then beneficiated from a Marie Curie Intra-European fellowship to at the Natural History Museum of London for two years before being hired at CNRS in 2007 at the Institute of Chemistry and Material resources (Poitiers, France). Since then his work revolves around the analysis of structural and dynamical fluids in contact with natural phyllosilicates by means of experiments (mainly X-ray diffraction) and molecular simulations for the understanding of the fate of water and solutes in the environment. His contribution to the field was awarded in 2015 by the bronze medal of the CNRS.

Order-disorder in water confined in natural swelling clays

Swelling clay minerals are ubiquitous in surface environments, both terrestrial and marine, where they often represent one of the main mineral components. Their bidimensional crystal structure involves colloidal size (< 2µm) negatively charged layers constituted with two tetrahedral layers sandwiching an octahedral one. The charge deficit resulting from cationic substitutions in either the tetrahedral or octahedral layer is compensated for by exchangeable cations located in the interlayer space. The moderate charge of the layers (between-0.1 and-0.2 C/m2) allows water molecules to penetrate the interlayer space and hydrate the interlayer cations, which results in a swelling of the crystal structure [1-2].

As a function of relative humidity (RH) and under non-saturated conditions, smectite typically shows a stepwise hydration behaviour corresponding to the intercalation of 0, 1 or 2 discrete sheets of water molecules in its interlayer [1-2]. However, heterogeneities of charge location (between octahedral and tetrahedral sheets) and/or of charge amount (from one interlayer to the other or within a given interlayer) most often lead to the coexistence of different hydration states within smectite crystals [3]. These heterogeneities are best revealed by comparing X-ray diffraction (XRD) patterns recorded on the same smectite sample under contrasting RH conditions. Calculated XRD patterns can then be fitted to experimental profiles using a trial-and-error procedure. The obtained structural models allow describing the hydration behaviour of the swelling smectite layers, and more especially their hydration heterogeneity and the evolution of layer hydration as a function of RH [4-5].

By accounting for smectite hydration heterogeneity it is possible to further refine the interlayer structure of hydrated smectite layers. In that perspective, molecular simulations can be used to unravel the details in the organizational properties of the confined fluid. Combination with experimental diffraction/scattering techniques can provide, however, key quantitative information about the validity of the semi-empirical atomic interaction parameters used in theoretical simulations [6-7]. Application of such a procedure combining experimental diffraction data and molecular simulations will be presented for the specific case of deciphering the molecular organization of interlayer water and cations in the different swelling clay hydrates (mono-, bi-, and tri-hydrated layers) [8-9].

Keywords

2D natural lamellar swelling clays; X-ray diffraction; molecular simulations; water confinement

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Biography

Nadine CANDONI is Head of the Biomedical Engineering Department of Polytech Marseille. She graduated in Physics and Chemistry at ENSCPB (1992) and obtained a PhD in Condensed Matter, Chemistry and Organization at Paris VI (1998). Nadine Candoni is professor at the Centre Interdisciplinaire de Nanoscience de Marseille (CINaM-UMR7325), which she joined in 1999. She first studied physico-chemical properties of individual molecules with Atomic Force Microscopy and Mechanically Controlled Breaking Junction. Nadine CANDONI is currently leading studies on nano-droplets (nL) for chemical reactions of solutes, using droplet-based microfluidics. She investigates from the generation of these nanoscale droplets to physicochemical properties of solute aggregation. Applications of her work concern crystallization of proteins and active pharmaceutical ingredients and jellification of biomimetic microparticles for Biomedical interests. She is the author of more than 70 publications and book chapters.

Nanodroplets to study crystallization and jellification phenomena using droplet-based microfluidics

We study crystallization of pharmaceutical molecules (proteins and active pharmaceutical ingredients) and jellification of biomimetic microparticles in nano-droplets (volume of nL), using droplet-based microfluidics:

- In crystallization in solution, the nucleation step determines the physical properties of crystals. However, the stochastic nature of the nucleation step requires a large number of experiments to obtain reliable data through statistical analysis. Using droplet-based microfluidics, experiments are carried out in hundreds of nano-droplets used as nano-crystallizers, while saving time and material. The size and frequency of the droplets are controlled without using surfactants [1]. We developed a versatile and easy-to-use microfluidic platform for non-specialists in microfluidics to: directly solubilize the powder of molecule of interest for solubility determination[2]; study nucleation kinetics[3] and polymorphism [4], generate a chemical library for crystallization condition screening[5], measure the concentration of the droplets by UV spectroscopy [6], validate polymorphism by Raman spectroscopy [2] and determine structure by X-ray diffraction [7].
- The Biomedical application aims to generate red blood cell mimes to validate an ultrasound tool for the diagnosis of red blood cell hyper-aggregation involved in thrombosis and diabetes. Therefore, calibrated microparticles are produced from nano-droplets of sodium alginate solution, by a contraction method [8]. They are jelled with calcium chloride giving deformable porous microparticles that are characterized in terms of mechanical properties, by Atomic Force Microscopy (AFM) and by manipulation with micro-clamps, and in term of structure by Scanning Electron Microscopy (SEM). [9]

Keywords

Droplet-based microfluidcs; Crystallization; Polymorphism; Jellification; Biomimetic microparticles

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Biography

François LUX is a chemist, born in Le Mans in 1980. He was graduated by Ecole Normale Supérieure de Lyon and was laureate of Agregation of chemistry in 2003. In 2007, he received his PhD degree for his work on the synthesis and functionalization of lanthanides complexes. In 2009, he was recruited as assistant professor in the FENNEC team of Pr Olivier Tillement in Institute of Light and Mater of university Lyon 1. He was one of the co-inventor of the AGuIX nanoparticles currently in phase 2 clinical trial for the treatment of cancer in combination with radiation therapy and of MexCD1 polymer in phase 1 clinical trial for the treamtment of Wilson disease. He is co-founder of NH TherAguiX and MexBrain companies that are developping these two products. He has co-authored 116 scientific papers and 29 patents mostly on nanohybrids and their biomedical applications. He displays h-index of 35.

Translation to the clinic of an ultrasmall nanoparticle for treatment of cancer in combination with radiotherapy

During the last decades, ultrasmall inorganic nanoparticles have attracted growing interest due to their favorable properties for biomedical applications including tumor penetration by enhanced permeability and retention effect and easy elimination by the kidneys [1]. AGuIX nanoparticles are such king of ultrasmall nanoparticles designed for enhancement of radiotherapy. They are composed of a polysiloxane matrix on which gadolinium chelates are covalently grafted and display hydrodynamic diameter close to 5 nm [2]. Due to the presence of gadolinium atoms, AGuIX can be followed by MRI after intravenous administration and can act as radiosensitizers during treatment by radiotherapy. Their efficacy has been tested in more than twelve animal models of cancer before final translation in the clinic [3]. The synthesis of the nanoparticles has been optimized and scaled up and regulatory toxicity tests on two animal species have demonstrated very good tolerance profile. Consequently, the particles have been translated to the clinic first for treating brain metastases by whole brain radiation therapy (Phase I clinical trial NanoRad). During this clinical trial, no evidence of toxicity was shown and a clear targeting of the metastases has been demonstrated [4]. First encouraging insights have been shown also for the radioensitizing potential of these nanoparticles [5]. Following the success of this first clinical trial, phase 2 clinical trials have begun on the same indication and on others in France and in the US.

Keywords

Ultrasmall nanoparticles; Clinic; Cancer; Radiosensitization; Gadolinium

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Biography

Nicolas MARTIN is a CNRS researcher at Centre de Recherche Paul Pascal (CNRS, University of Bordeaux, France). After completing his PhD in 2014 at Ecole Normale Supérieure in Paris on polyelectrolyte-assisted protein folding, he spent 4 years as a post-doc in the group of Prof. Stephen Mann at the University of Bristol (UK) to work on synthetic cells. He joined CNRS in 2018 where his current research interests focus on the design and characterization of reactive and responsive coacervates based on polyelectrolytes, nucleic acids, peptides or amphiphiles to mimic the dynamic organization of membraneless organelles in cells and shed light on the emergence of self-assembled life-like compartments.

Bio-inspired compartments based on liquid-liquid phase separation

Living cells are self-organized soft matter systems whose hierarchical structure spans from the nanoscale up to the microscale. Compartmentalization at all these length-scales is crucial for the dynamic coordination of biochemical reactions in space and time. Beyond canonical membrane-bounded organelles, such as the nucleus or mitochondria, membrane-less condensates formed by liquid-liquid phase separation of proteins and polynucleotides are now widely recognized to be important intracellular organizers. Recent years have witnessed a growing interest in the bottom-up assembly of synthetic micro-compartments that mimic the structure and functions of these condensates and that can serve as modules to assemble synthetic cells. Our research focuses on the design of microdroplets produced by liquid-liquid phase separation in aqueous polymer solutions, such as coacervates, as bio-inspired functional compartments.[1] In this talk, I will in particular show that stimuli-responsive coacervate microdroplets provide a promising approach to assemble dynamic models of biomolecular condensates.[2,3] Although the systems we study are typically micrometre in size, I will also show that nanoscale processes do contribute to the observed phenomena, in particular at the interface of droplets.[4] Recent directions towards the construction of more advanced synthetic cells that integrate multiple functions in a droplet will also be discussed.[5]

Keywords

Coacervates; bio-inspired self-assembly; stimuli-responsive systems; synthetic cells; membraneless organelles

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Biography

Catherine ESPECEL is Professor at the Institute of Chemistry Materials and Natural Resources of Poitiers (IC2MP). She obtained her PhD in 1997 at the University of Poitiers in heterogeneous catalysis involving supported metallic systems, and in 1998, she did a postdoc at the French Synchrotron Laboratory (LURE-Orsay). In 2008, she was nominated Associate Professor and since 2014, she is the co-head of the SAMCAT group of IC2MP, which comprises 37 permanent staff and around 30 PhD and postdoc researchers. Her main research topics include the preparation of multimetallic catalysts notably by using surface redox reactions, with applications in fine chemistry, energy and biomass valorisation (selective hydrogenation and hydrogenolysis, catalytic reforming, selective ring opening). She has supervised or co-supervised 19 PhD students, 4 postdoc, published as co-author near 80 peer-reviewed journal articles (hindex 26), 3 patents, 3 book chapters, and given around 45 oral communications.

Surface redox reactions for tuning the surface composition of bimetallic nanoparticles and their catalytic properties: the contribution of Poitiers catalysis laboratory

Bimetallic catalysts have emerged as an important class of heterogeneous catalysts since they have played a significant role in petroleum refineries, especially in enhancing the octane number of gasoline. After this discovery, a number of bimetallic catalysts have been reported for a range of reactions including oxidation, hydrogenation, hydrogenolysis, and reforming reactions. The properties of bimetallic catalysts are significantly different from their monometallic analogues. Indeed, the modification of a monometallic catalyst by the addition of a second metal is an important approach for tailoring the electronic and geometric structures of the nanoparticles to enhance their catalytic activity and selectivity. In many cases, bimetallic nanoparticles have higher catalytic efficiencies than their monometallic counterparts, owing to strong synergy between the metals.

Nowadays, many research activities are devoted to the development of new bimetallic catalysts, because of the tremendous demand for high-performance catalysts for various practical applications. Because of the presence of a second metal component, the complexity in preparing these materials increases, and in many cases it is the method of preparation which determines the final structure, and hence properties, of these materials.

During this presentation, the preparation of various supported bimetallic systems for applications in the transformation of bio-renewable substrates and in energy will be presented, with a focus on the surface redox reactions developed in our research group since the 1990s. The preparation of bimetallic M1-M2 catalysts by surface redox reactions occurs at the surface of the monometallic M1 nanoparticles and an oxidized form of the M2 modifier and is governed by the electrochemical potential of the species implied in the reaction. This process can be direct (direct redox reaction or galvanic replacement) or may involve an intermediate reducing agent activated at the surface of M1, as H2, for reducing the oxidized form of the M2 modifier (refilling or catalytic reduction).

Keywords

Bimetallic catalysts; surface redox reactions; galvanic replacement; refilling; catalytic reduction

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Biography

Hazar GUESMI earned her Ph.D. degree in Materials Science at the University of Aix-Marseille III, France (2005). She performed her doctoral work under the supervision of Prof. Müller and Dr. Tréglia at the "Centre de Recherche de la Matière Condensée et des Nanosciences" in Marseille, where she studied the adsorption mechanisms on Si surfaces. From 2005 to 2006 she worked as assistant professor at the university "Pierre et Marie Curie", Paris VI and she developed her research activity on gold nanodots in the Institut des NaonoSciences de Paris. In September 2006 she obtained a Post Doctoral grant via the European Network of Excellence and she worked for two years on the modeling of DeNox reaction in zeolites at the Institut Charles Gerhardt in Montpellier. In October 2008 she was appointed as a permanent CNRS researcher in the "Laboratoire Réactivité de Surface" in Paris (Sorbonne université) and after four years she moved to the ICGM. Currently, she is member of the Theoretical Physical Chemistry and Modeling department at the "Institut Charles Gerhardt" where she develop computational and theoretical studies on surface science and heterogeneous catalysis.

Predicting realistic shape and structure of nano-catalysts under working conditions: Are we there ?

Metallic and bimetallic nano-catalysts typically operate under high-pressure and high-temperature conditions, and this reactive environment may substantially influence the structure and the surface composition and therefore the reactivity of these nano-materials. Theoretical studies of catalytic properties are often investigated on model systems (extended surfaces and/or small nanoparticles) where no account is taken for the possibility that the catalyst surface composition can be modified after the gas exposure [1]. This is a serious drawback that may prevent reliable description of the catalyst reactivity that mainly depends on the configuration of the surface. Nowadays, modeling the equilibrium structure and the shape of nano-catalysts in a “realistic” reactive environment is still a barely studied subject and remains an extremely challenging task.

Recent works in the group were focusing on the prediction and the study of the structural changes of metallic and bimetallic systems under reactive gas and on their related catalytic properties [2-5]. Different theoretical approaches based on Density Functional Theory (DFT) calculations, Monte Carlo (MC) and ab-initio molecular dynamic (AIMD) simulations were developed to predict “realistic” catalytic surfaces under reaction conditions. In this talk, I will present an overview of our main recent results and I will focus on the advantages and limitations of the developped theoretical approaches.

Keywords

Structural dynamics; heteregenous catalysis; DFT and molecular dynamics; Surfaces and nonparticles; Effect of reactive gas

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Biography

Having a PhD from Université Paul Sabatier, Toulouse, Jean-Cyrille HIERSO is now full professor of Chemistry since 2009, at the Institute of Molecular Chemistry at the Université de Bourgogne, Dijon. He has interest in the fields of organometallic chemistry, ligand design, homo- and heterogeneous catalysis, chemical physics and material sciences. In 2011 he was awarded the National Prize for Coordination Chemistry from the French Chemical Society (SCF) and at the end of 2012 he was elected Member of the French Professors Academy "Institut Universitaire de France" (IUF). He has been nominated Junior Distinguished Member of the SCF in 2015. Topics developed in his group concern catalytic C–H bond functionalization, C–C and C–heteroatom bond formation, and sp3-C-based nanochemistry with applications in transition metal reactivity, especially palladium, gold and ruthenium.

Engineering Nanodiamonds from Gas Phase or Solution: Applications in Ammonia and Dihydrogen Sensing and Catalysis

Diamondoids (aka molecular nanodiamonds) are cage hydrocarbon molecules that can be described as fully hydrogen-terminated nanometer-sized diamonds. Adamantane and diamantane are the smallest diamondoids, and their selective functionalization can be achieved with high efficiency at various positions of the hydrocarbon cage [1]. We reported the mild physical vapor deposition of such functionalized nanodiamonds, which provides robust nano- and microstructured self-assembly of organic micro and nanocrystals [2]. Then, a bottom-up construction of hybrid organic–inorganic nanocomposites with a coated metal surface as ultrathin nanolayer on phosphine-functionalized nanodiamonds was stepwisely achieved from the gas phase by the low-temperature chemical vapor deposition (45 °C) of an organometallic complex over the self-assembled diamondoid scaffold [3]. Palladium nanolayered composites can be used to detect toxic NO2 and NH3 gases. NO2 detection down to 50 ppb and NH3 detection at 25 ppm concentration with fast response and recovery processes at 100 °C was demonstrated [4].

Other functionalization of adamantane and diamantane, including the introduction of sulfur functions [5], opened the way to the synthesis in solution of dense networks of metal nanoparticles. The control of the growth of sub-2-nm gold nanoparticles is achieved by the formation of well-defined networks, assembled in a single step reaction by employing bifunctional bis-adamantanedithiol (BAd-SH) or diamantanedithiol (DAd-SH). These are serving both as bulky surface stabilizers and short-sized rigid linkers. Uniformly small gold NPs (1.3 ± 0.2 nm to 1.6 ± 0.3 nm) embedded in insoluble frameworks are organized alongside short interparticular distances ranging from 1.9 to 2.7 nm. These were used for highly selective heterogeneous gold-catalyzed enyne cyclization to five-membered diene [5], while this reaction suffers from serious selectivity troubles in homogeneous catalysis. The control over the selectivity results from atoms cooperation at the gold surface that we analyzed in joint experimental and theoretical studies combining XPS, NMR and DFT. Further applications of such recoverable nanocatalysts in networks extend to ruthenium-catalyzed selective alkyne hydrogenation [6] and ammonia-borane solvolysis for high rate H2 production [7,8].

Keywords

Nanocomposite; Nanodiamonds; Organometallic; Interface; Reactivity

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Biography

Aurélien HABRIOUX is 40 years old. He obtained his PhD at University of Poitiers in 2009. He completed a postdoctoral fellowship at CEA Saclay. He is an associate professor at University of Poitiers since 2011. He has his expertise in electrocatalysis. His research interest is focused on designing and characterizing electrocatalysts for hydrogen evolution, oxygen reduction and oxygen evolution reactions in alkaline medium. He has been coordinating several research projects aiming at developing heterostructured catalysts for the positive electrode of high energy density metal-air batteries (Zn/air, Al/air). He is deeply involved in the design of nanocatalysts composed of 3d transition metal-based active phases (oxides, hydroxides, sulfides) supported onto 2D materials (MXene, graphene derivatives). He works on the understanding of the role played by the active phase/susbtrate interaction on the electrocatalytic activity. He is also interested in scrutinizing and explaining the dynamics of electrochemical interfaces (surface reconstruction phenomenon, interactions in the double layer) upon working conditions.

Tailoring nanomaterials for oxygen electrocatalysis

Electrocatalysis is involved in many electrochemical energy storage and conversion devices (electrolyzers, fuel cells, metal-air batteries,…) that will implement the future energy grid. The design of efficient electrodes allowing increasing the rate of electrochemical reactions is required to enhance the electrical performances of the above-mentioned devices. Performances of electrodes depend on a complex etanglement between the intrinsic properties of the catalyst (chemical composition, crystal structure, exposed facets, partial charges on surface atoms, morphology) and the characteristics of the electrode itself (conductivity, porosity).

This presentation focuses on the different steps allowing the rational design of electrocatalysts:

- Identification of potentially efficient surfaces
- Synthesis and characterization of nanocatalysts
- In-depth conceptual understanding of electrocatalytic processes by establishing the relationship between the physico-chemical properties of the nanocatalyst and its electrochemical behavior (activity, durability).

This scientific approach will be mainly illustrated by investigating 3d transition metal-based heterostructured catalysts designed for oxygen evolution and reduction reactions in alkaline medium [1-10]. The tailoring of cheap, efficient and stable materials for oxygen electrocatalysis remains a major challenge in modern electrochemistry.

Keywords

Oxygen electrocatalysis; 2D materials; Heterostructured catalysts; 3d transition metal

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Biography

Elena SAVINOVA received her PhD from the Boreskov Institute of Catalysis of the Russian Academy of Sciences (BIC) in 1988. She has worked as a senior research fellow at the Boreskov Institute of Catalysis (Novosibirsk, Russia), at Technische Universität München (Garching, Germany), and as a visiting researcher at Fritz-Haber-Institut der MPG (Berlin, Germany). Since 2007 she is full professor at the University of Strasbourg. She is head of the group «Electrochemistry and Energy Conversion» at the Institute of Chemistry and Processes for Energy, Environment and Health (UMR7515). In 2006 she was awarded Chair of Excellence in chemistry from the National Research Agency and in 2014 became Fellow of the International Society of Electrochemistry. Her research interests are concerned with interfacial electrochemistry, energy conversion, electrocatalysis and operando spectroscopies.

Electrocatalysis of the oxygen evolution reaction by transition metal oxide nanoparticles

The European Commission launched the European Green Deal with the objective to make Europe climate-neutral by 2050. This plan foresees significant increase in the green hydrogen production by water electrolysis for its use as an energy carrier and feedstock for industry. Last decades have evidenced significant advances in proton-exchange membrane water electrolysis (PEMWE) technology, both in terms of materials and system developments. However, commercial PEMWE systems rely on scarce and Ir for catalyzing sluggish oxygen evolution reaction (OER) occurring at the anode. Recent developments in the field of anion-exchange membranes (AEM) have switched focus of current research towards AEM-based water electrolysis technology (AEMWE), which is compatible with PGM(platinum group metal)-free materials. Yet, development of active and durable PGM-free anode materials for the AEMWE technology still presents a significant challenge.

In this presentation we will discuss electrocatalysis of the OER by transition metal oxides (TMO). We will show that the apparent electrocatalytic of PGM-free TMOs is often limited by their low electronic conductivity [1]. To increase the OER current, TMOs are often mixed with conductive binders or supported on conductive supports [1]. We will demonstrate that utilization of such ubiquitous conductive materials as carbons is prohibited at the AEMWE anode due to their oxidative degradation [2]. We will then present two alternative approaches: (i) supporting TMO nanoparticles on high-stability boron doped diamond (BDD) [3], and (ii) development of core-shell nanoparticles comprised of a conductive Fe_3O_4 core and a catalytically active $CoFe_2O_4$ shell [4]. We will show that confining the active component in a thin (~1-2 nm) shell and taking advantage from the core-shell synergistic interaction allows one to reach an extraordinary OER activity. Finally, we will present the results of operando near edge X-ray absorption fine structure (NEXAFS) spectroscopy [5] and discuss the origin of the synergy between the core and the shell.

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Keywords

Water electrolysis; Oxygen evolution reaction; Transition metal oxides; Core-shell nanoparticles; Operando near-edge X-ray absorption fine structure spectroscopy

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Biography

Dr. Megan J. CORDILL (she/her/hers) is the deputy director and group leader at the Erich Schmid Institute of Materials Science of the Austrian Academy of Sciences. Dr. Cordill studied materials science and engineering at the University of Minnesota and earned her PhD in 2007. Her research interests include thin film adhesion, nanoindentation, structure-properties relationships of thin films, as well as probing electrical, thermal, and mechanical properties using advanced in-situ techniques. Dr. Cordill has published more than 150 SCI papers, edited 4 special issues on materials science and diversity topics, and has an h-index of 25 (Scopus). She is an active member of TMS, MRS, and AVS. In 2008, Cordill recipient of the Lise Meitner Fellowship for post-doctoral research in Austria, and in 2020 placed 2nd for the prestigious Houska Prize, Austria's largest private prize for applied research.

Single and multilayer electro-mechanical behavior studied with in-situ methods

Electrical and mechanical properties of thin metal films on compliant polymer substrates are important to understand in order to design reliable flexible electronic devices. Single and multilayer films of Cu and Al on polyimide (PI) substrates were examined for their use as interconnects in flexible electronic devices with and without the use of Mo, Cr, or Nb interlayers. Using in-situ tensile straining with X-ray diffraction (XRD) and confocal laser scanning microscopy (CLSM) mechanical behavior can be examined. CLSM can provide information about crack spacing and film delamination, while XRD experiments are utilized to determine the lattice strains and stresses present in the films. If these in-situ techniques are combined with in-situ 4-point-probe (4PP) resistance measurements, the influence of the mechanical damage on the electrical properties can be correlated. This combination of multiple in-situ investigations are particularly useful when studying the electro-mechanical behavior under uniaxial and biaxial loading conditions to better understand were complete electrical failure occurs. Mechanisms behind these phenomena as well as the role of film thickness, residual stresses, and film architecture will be discussed.

Keywords

thin films; electrical behavior; mechanical behavior; in-situ; x-ray diffraction

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Biography

Eva WEIG is a Full Professor at the School of Computation, Information and Technology of the Technical University of Munich (TUM) in Germany. She holds the Chair of Nano and Quantum Sensors and is a Director of the TUM Center for QuantumEngineering. Before joining TUM in 2020, she spent eight years as a Full Professor at the Department of Physics of the University of Konstanz in Germany. Eva got a PhD in Physics from Ludwig-Maximilians-University (LMU) in Munich, Germany, in 2004, where she also worked as a Junior Research Group Leader following her postdoc at the California NanoSystems Institute at the University of California at Santa Barbara (UCSB).
Research at the Chair of Nano & Quantum Sensors is dedicated to nanomechanical systems. Among others, the group has pioneered the integrated dielectric control of high Q nanomechanical resonators. Research interests include the nonlinear dynamics and the coherent control of nanomechanical systems, the study of coupled nanoresonators and nanomechanical arrays, as well as cavity opto- and electromechanical systems.

Nanomechanics: Playing the nanoguitar to explore the dynamics of harmonic oscillators and two-level systems

Nanomechanical resonators are freely suspended, vibrating structures with nanoscale dimensions. They show great promise as versatile linking elements in hybrid nanosystems, as sensors or signal transducers both in the classical and in the quantum realm, generating an increasing amount of attention both for fundamental explorations and for practical applications. Here I will focus on doubly-clamped pre-stressed nanostring resonators. These seemingly simple devices exhibit remarkably large room temperature quality factors and enable electrostatic control [1]. Nanostrings are thus an ideal testbed to explore a variety of dynamical phenomena. Revent progress in controlling the coherent as well as the nonlinear dynamics of high Q nanostring resonators will be reviewed. In particular, I will discuss the interplay between the two orthogonal fundamental flexural modes of the string vibrating in- and out-of-plane with respect to the sample surface. These two modes are strongly coupled and reveal a pronounced avoided crossing [2], which can be described as a classical two-mode system mimicking the coherent dynamics of a quantum two-level system [3,4]. Further, the the nonlinear dynamics of the resonantly driven nanostring will be highlighted, which gives rise to thermomechanical squeezing [5], and has recently been shown to lead to the generation of a novel type of frequency comb [6].

Keywords

Nanomechanics; high quality factor; nonlinear dynamics; coherent control; nanoelectromechanical systems

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Biography

After graduating from Institut d'Optique Graduate School, I obtained my PhD in Physics, (Optics and Photonics, Paris XI Orsay), in 1995. Since then, I have been working as a scientist in CEA Paris Saclay, going from the applied to the fundamental research division. I am currently part of the condensed matter laboratory, my main research topic being devoted to nanophotonics. More particularly, my studies mainly involve optical nano-antennas and molecular plasmonics, organic nonlinear optics and light emission (time-resolved fluorescence spectroscopy, frequency conversion), photochromism, molecular self-organisation, photoinduced ordering and mass transport … I have authored or co-authored more than 110 papers. In addition to my research activities, I am coordinating a so-called laboratory of Excellence of Paris Saclay University, aiming at promoting synergies between interdisciplinary scientists of different research fields, from nano(spin)electronics to nanophotonics, nanomedicine and nanochemistry.

Playing with plasmons, molecules or dielectric nanoparticles to control light emission at the nanoscale

Controlling light emission at the nanoscale is of primary importance, not only from a fundamental point of view, but also in terms of potential applications, be it for the implementation of emitting devices or markers for biology ... To this end, an important point to keep in mind is that spontaneous emission is not only an intrinsic property of a luminescent material, it is also the result of the interaction between this material and its local electromagnetic environment. More precisely, light emission depends directly on the transfer of energy from a given photon source to one or more modes of the electromagnetic field. In this context, many studies have been devoted to the coupling of fluorescent nano-objects to plasmonic nano-antennas, considering either one-photon or two-photon processes. [1] Two-photon excitation processes present indeed the advantage to give rise to much larger enhancement than one-photon-excited fluorescence due to the quadratic dependence of this process on the excitation intensity. However the coupling of fluorophores to a metallic nanoantenna can also give rise to quenching effects (through either Förster or Dexter energy transfer), which requires to control both the position and the orientation of the molecules to the antenna : this issue will be the first point of my presentation. I will show that a promising way towards this goal can be to take advantage of supramolecular molecule-molecule or molecule-substrate interaction processes. In close collaboration with chemists, we could demonstrate the interest of specifically designed molecules from so-called Janus systems [2] to metal-ligand complexes [3]. In the second part of my talk, I will address the case of a nonresonant nonlinear process, i.e. frequency conversion and more particularly second harmonic generation (SHG). I will discuss our recent results obtained with single Barium titanate particles (BaTiO3) particles coated with a 10 nm gold shell, for which a factor of 3 SHG enhancement could be evidenced [4]. I will finally show that gold nanoparticles can themselves exhibit a very high two-photon luminescence [5], which happens to be very interesting for characterization, from nanorods organization [6] to nanothermometry [7].

Keywords

Metallic and dielectric nanoparticles; two-photon luminescence; second harmonic generation; plasmonic antennas

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Bernhard URBASZEK

TU Darmstadt I Professor

Institute of Condensed Matter Physics

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Biography

After obtaining a doctorate at the Heriot-Watt University of Edinburgh, Bernhard URBASZEK joined the department of quantum optoelectronics of the Laboratory of Physics and Chemistry of Nano-Objects in Toulouse in 2003. He was then appointed lecturer at the National Institute of applied sciences of Toulouse before joining the CNRS in 2008 as a tenured senior researcher. In 2013, he obtained an ERC Consolidator Grant Award, Optically controlled carrier and Nuclear spintronics: towards nano-scale memory and imaging applications and became CNRS Director of research in 2014. He was elected Fellow at the American Physical Society in 2022 and is now Professor at the TU Darmstadt at the Institute of Condensed Matter Physics. His main research focuses on the physics of light-charge-spin interactions in low-dimensional materials, in particular quantum dots, as well as the manipulation of quantum states in new atomically thin semiconductors.

Engineering Quantum States in 2D semiconductors

The physical properties of atomic monolayers often change dramatically from those of their parent bulk materials. Prime examples are monolayers of graphite (graphene) and MoS2, as their ultimate thinness makes them extremely promising for applications in electronics and photonics. Transition metal dichalcogenide monolayers (TMD) MoS2 and WSe2 show remarkable light-matter interaction and tunable non-linear optical properties such as strong second harmonic generation [1]. Their optical properties are governed by excitons, Coulomb bound electron-hole pairs, even at room temperature [2]. In this talk we discuss how tuning optical properties is achieved through engineered growth of monolayers and also by coupling these TMD monolayers to the optical resonances in silicon nanostructures.

In lateral (in-plane) MoSe2-WSe2 monolayer heterostructures grown by chemical vapor deposition the two materials form a junction region as narrow as 2 to 3 nm. We report uni-directional exciton transport experiments across the junction (an ‘exciton diode’) in tip-enhanced photoluminescence with a spatial resolution of 30 nm [3].

We show exciton spectroscopy results on Janus monolayer structures SeMoS with different top and bottom chalcogen atoms obtained through a novel growth approach [4]. These systems host excitons with an intrinsic static dipole and give rise to strong optical non-linearities.

Finally, we discuss how emission and absorption for monolayers can be enhanced and tuned via near field coupling to Mie resonances of silicon nanostructures that are compatible with CMOS technology [5].

This work is carried out in collaboration with the LPCNO Toulouse, CEMES and LAAS Toulouse, FSU Jena (Germany) and NIMS Tsukuba (Japan).

Keywords

2D Materials; Photonics ; Optoelectronics

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Kevin VYNCK

CNRS I Researcher

Institute of Light and Matter

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Biography

Kevin Vynck is a CNRS Researcher at the Institut Lumière Matière (iLM) in Lyon, specialized in the theoretical and numerical modelling of light scattering by complex nanostructures. He received his PhD from the University of Montpellier in November 2008, and was post-doctoral fellow at LENS in Florence (Italy) and at the Institut Langevin in Paris. Between 2013 and 2021, he was CNRS researcher at the Laboratoire Photonique, Numérique et Nanosciences (LP2N) in Bordeaux. With his colleagues, he was amongst the firsts to propose using resonant silicon nanostructures for metamaterial applications, to exploit correlated disorder in planar photonic structures for light trapping in thin films, and to investigate the potential of disordered metasurfaces for visual appearance design. In 2019, he was awarded the CNRS Bronze Medal.

Predicting and designing the visual appearance of macroscopic nanostructured surfaces

Nature offers us beautiful visual appearances. The most resplendent of them, from the iridescence of opals and the wings of some butterflies to the bright colors of some birds and fruits, are mostly due to interference effects created by nanostructures. These last decades have witnessed the emergence of new research themes aiming at understanding the microscopic origin of visual effects produced in nature, at reproducing these effects by artificially structuring matter, and at creating new ones- without equivalents in the natural state- for new applications in visual arts.

Research in nanophotonics has mainly focused so far on creating a broad palette of structural colors, as illustrated by many successful reproductions of famous photographies and paintings at the millimeter scale [1]. Our perception of macroscopic objects however strongly depends on attributes other than color, such as gloss, haze and translucency, as well as object shape and lighting environment [2].

In this talk, I will show how concepts and techniques in nanophotonics, mesoscopic wave physics and computer graphics can be combined to predict and design the visual appearance of macroscopic nanostructured surfaces in realistic settings [3]. We will see how certain nano and mesoscale features, such as layered substrates and correlated disorder, translate into distinct, impressive visual effects at the macroscale.

Keywords

Structural colors; Visual appearance; Waves in complex media; Computer graphics

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Simon HURAND

University of Poitiers I Professor
Pprime Institute
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Biography

Simon HURAND is a material scientist with a main focus on the experimental study of the electrical and optical properties of thin films. His PhD work at ESPCI in Paris focused on the study and the control of superconductivity in LaAlO3/SrTiO3 oxides interface through low-temperature electrical measurement. After a Post-doctoral at ICFO in Barcelona on the electro-mechanical properties of freestanding carbon nanotubes, he joined the Université de Poitiers in 2016 as a Maître de conférences (assistant professor). Since then, he developped an expertise on the measurement of the optical properties of bulk materials and thin films through spectroscopic ellipsometry in the visible and infrared ranges, as well as low-temperature electrical measurements. His main research topic now focuses on the electrical and optical properties of a new family of 2D materials called MXenes.

Measuring temperature dependent optical indexes by spectroscopic ellipsometry

Spectroscopic Ellipsometry is a powerful tool to unravel the optical properties of materials (bulk or thin films), allowing to extract their optical indexes. It is non destructive, fast, and can be performed in ambient environment or as an in-situ measurement. While reference optical indexes of materials are often available in the litterature for the UV-visible-NIR range, it is often hard to find similar references in the infrared range. Morever, optical indexes available from a reference "ideal" material are often not transposable to a given preparation method (e.g. Physical Vapor Deposition) because it can induce for example porosity, non-stoechiometry, partly amorphisation or multi-grain microstructure, among others. This can induce significant discrepancy in the simulation of the radiation behavior of materials or nanoscale heterostructures. When it comes to temperature dependent optical indexes, the avalaible data base of optical indexes becomes even more sparse. Therefore, there is a need for the measurement of optical indexes of specific materials, in order to correctly represent radiation properties of materials, including spectral variation (up to the infrared range) and temperature dependence. In this presentation, I will introduce the principle of Spectroscopic Ellipsometry, with a focus on the limitations of the measurement and the analysis method to extract the optical indexes, and present some examples of temperature-dependent optical indexes from the UV to the FIR range.

Keywords

Spectroscopic Ellipsometry; Optical properties; Infrared; Thin films

David LACROIX

University of Lorraine I Professor

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Biography

David LACROIX is Professor at the Université de Lorraine in Nancy. Within the LEMTA (Laboratoire Energies & Mécanique Théorique et Appliquée) his group is interested in the study of thermal transport at the nanoscale by both experimental (Scannig Thermal Microscopy, Thermoreflectance, Raman spectroscopy, …) and theroretical (DFT, MD, …) approaches. His research activities are mostly related to the modelling of thermal transport in nanostructured semiconductors using Monte Carlo techniques through the development of numerical tools dedicated to the resolution of the Boltzmann Trasport Equation for phonons. The applications of his research concerns thermal management and thermoelectricity.

Monte Carlo simulations of heat transport in nano-devices, a brief overview and recent developements

Models and numerical tools devoted to the simulation of thermal material properties as well as heat transport in nano and micro-structures have been more and more popularized during the two last decades along with the rapid development of computing ressources. Atomistic scale modeling, which includes Density Functional Theory (DFT) and Molecular Dynamics (MD) based methods, is now very popular to predict with few or no assumption material transport properties allowing to explore in-silico lot of different pure or not compounds. However, even if those approaches are powerfull and increasingly accurate they inhently suffer of a major drawback, namely the computational resources required to perform simulations on devices whose size exceeds hundreds of nanometers. Yet the latter, such as nanowire, nanofilms, nanoporous structures, superlattices, etc., are often the ones which are produced in clean room and that are valuable for a lot of applications. In addition, for these nanosystems, the classical numerical approaches based on the assumption of a continuous medium (bulk-like) are often inadequate to describe the physics of transfers and effects such as ballistic transport or interface resistance. For semiconductors, what we call the "mesoscopic" scale (10nm~10µm) needs alternative tools to model and simulate heat exchange and thermal transport properties. To tackle this issue, we have developped in the group for many years, a simulation environment dedicated to the resolution of the Boltzmann Transport Equation for phonons using stochastic approaches known as Monte Carlo (MC) methods. With such methodology semiconductor devices with lengthscale that falls into the mesoscopic range can be accurately modelled in a broad range of temperatures; taking into account complex geometrical features and/or interface occurrence. In addition, recent developments shows that such calculations can be performed at fixed temperature and take advantage of Green-Kubo formalism to derive from heat flux autocorrelation thermal conductivity tensor in complex systems such as phononic membranes. In this talk, we will give a brief review of these MC models from non-equilibrium to equilibrium approaches and their application to the calculation of heat transport properties in nano-devices.

Keywords

Nanoscale heat transfer; Boltzmann Transport Equation; Monte Carlo Method; Thermal properties; Green-Kubo

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Maud VINET

SiQuance I Chief executive officer & Researcher

Electronics and Information Technology Laboratory

www.siquance.com

Biography

Maud VINET is currently CEO of Siquance, as start-up company aiming at developing and commercializing a quantum computer based on silicon.
She was previously leading the quantum computing program in Leti. Together with Tristan Meunier (CNRS) and Silvano de Franceschi (Fundamental research division from CEA), they received an ERC Synergy grant in 2018 to develop silicon based quantum computer.
She defended a PhD of Physics from University of Grenoble Alps and was hired Leti in 2001 as a CMOS integration and device engineer. From 2009 to 2013, she spent 4 years in Albany (NY, US) to develop Fully Depleted SOI within IBM Alliance together with STMicroelectronics. In 2015, she spent 6 month with Globalfoundries in Malta, NY to launch 22FDX program. From 2013 to 2018, she managed the Advanced CMOS integration team activities in Leti.
Maud Vinet authored or co-authored about 300 papers, she owns more than 70 patents related to nanotechnology and her Google h-index is 52 with more than 11000 citations.

Enabling full fault tolerant quantum computing with silicon based VLSI technologies

Quantum computing when available will tackle life changing applications, like in energy or chemistry. Silicon has the ability to enable this full quantum advantage leveraging Very-Large-Scale Integration (VLSI) fabrication and design techniques. First scientific demonstrations have been made, it's now up to electrical engineers in collaboration with physicist to turn these demonstrations into practical machines.

Keywords

Quantum computing; semiconductor; CMOS technology

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Maud VINET

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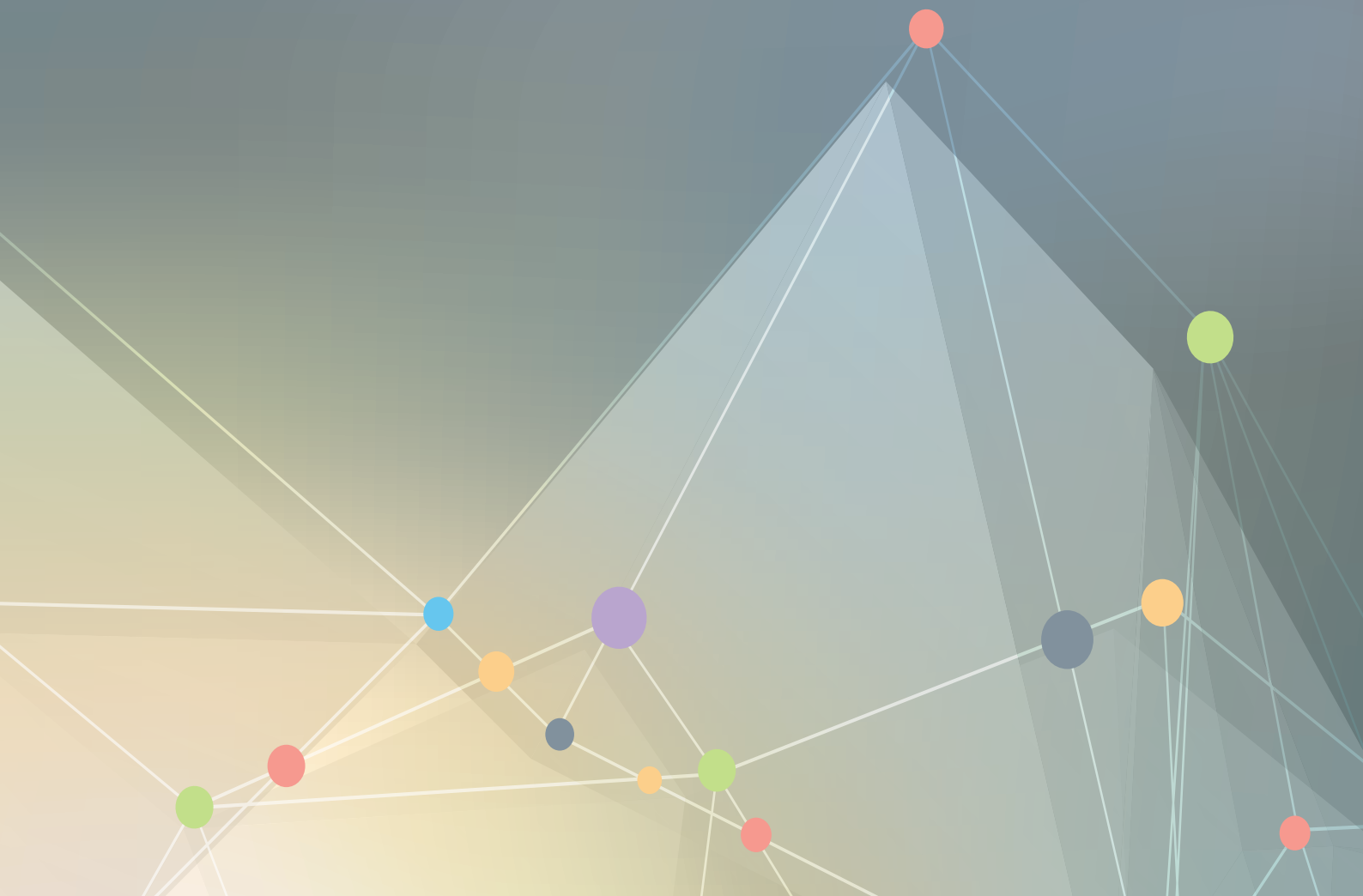
Nat Electron 4, 872–884 (2021). https://doi.org/10.1038/s41928-021-00681-y
This review paper was requested by Nature Electronics editors and reviews some technological challenges of spin qubits.

PHD THESIS AWARDS



PhD Thesis Awards

Interdisciplinary research

Florent BLANCHO

PhD from Univ. Rennes 1

Lab. Geosciences Rennes

Identification, production and characterization of environmental nanoplastics using geochemical and nanometrology tools

PhD thesis director: Julien GIGAULT (CNRS)

PhD thesis director: Mélanie DAVRANCHE (Univ. Rennes 1)

Muhammad Haseeb IQBAL

PhD from Univ. Strasbourg

Inst. Charles Sadron & Lab. Biomaterials and Bioengineering

Surface Engineering of Biobased Polymeric Nanofilms for Biomedical Applications

PhD thesis director: Fouzia BOULMEDAIS (CNRS)

PhD thesis supervisor: Florent MEYER (PU-PH)

Nathan LEROUX

PhD from Univ. Paris-Saclay

Mixed Physics Unit CNRS/Thales

Artificial Nural Networks with Radio-Frequency Spintronic Nano-devices

PhD thesis director: Julie GROLLIER (CNRS)

PhD thesis supervisor: Alice MIZRAHI (Thales)

Fundamental research

Salambô DAGO

PhD from ENS Lyon

Lab. of Physics

Stochastic thermodynamics: driving of microoscillators applied to the study and the optimization of information processing

PhD thesis director: Ludovic BELLON (CNRS)

PhD thesis supervisor: Sergio CILIBERTO (CNRS)

PhD Thesis Awards

Applied research

Nicolas DALLOZ

PhD from Univ. Jean Monnet

Lab. Hubert Curien

Printed image multiplexing by laser processing and its application to security and identity documents

PhD thesis director: Nathalie DESTOUCHES (Univ. Jean Monnet) & Mathieu HEBERT (Univ. Jean Monnet)

PhD thesis supervisor: Stéphane AYALA (HID Global)

Alice GRANGIER

PhD from Univ. Paris Cité

Lab. Matter and Complex Systems

Stimulation by a turbulent flow in bioreactors for the production of extracellular vesicles

PhD thesis director: Amanda SILVA (CNRS) & Claire WILHELM (CNRS)

PhD thesis supervisor: Florence GAZEAU (CNRS)

Special Award on sustainable development

Asmae EL MAANGAR

PhD from Univ. Montpellier

Ion Separation using self-assembled Molecular systems Laboratory

Hydrotropes formulated for sustainable metal extraction processes

PhD thesis director: Thomas ZEMB (CEA)

PhD thesis supervisor: Jean DUHAMET (CEA)

PhD Thesis Awards

RENATECH PhD Thesis Awards

Claire JOLLY

PhD from Univ. Montpellier

Institute of Electronics and Systems

Development of resonant microsensors made of alpha quartz layers synthesized by sol-gel process on silicon substrate

PhD thesis director: Adrien CARRETERO GENEVRIER (CNRS)

Feriel LAOURINE

PhD from Univ. Lorraine

Inst. Jean Lamour/C2N

Stainless steel patterning at micrometric scale with ICP chlorinated plasma: Process optimization and understanding of etching mechanisms

PhD thesis director: Thierry CZERWIEC (Univ. Lorraine)

PhD thesis supervisor: Stéphane GUILET (CNRS)

Nanoscience subdivision of SCF PhD Thesis Award

Alexandre ADAM

PhD from Univ. Strasbourg

Inst. of Physics and Chemistry of Materials of Strasbourg

Functional mesoporous silica-based nanoplatforms for magnetic hyperthermia, photothermia and drug delivery

PhD thesis director: Damien MERTZ (CNRS)

PROGRAM OF SPECIAL SESSIONS

- Nanopitch
- Art & Science
- Innovation

NANOPITCH

ELOQUENCE CONTEST

2023

Wednesday March 15th, 2023

For the first time, C'Nano organizes an eloquence contest: Nanopitch!
It's a 100% nanoscience speech contest! It will allow young doctors to present their thesis work very simply and with fun to the general public, their friends and their family!

3-minute pitch :
The whole challenge will be to present their research topic in an understandable way in such a short period of time!

At the end of the presentations, the public will be invited to vote in order to elect the best pitch of the evening!

The second prize will be awarded by a jury, composed of scientists and experts of science outreach.

Organizing committee:
Maéva LUBIN (CNRS – C'Nano); Elisabeth NAU (CNRS – IC2MP); Yves ALMECIJA (CNRS – CeRCA, IC2MP) ; Corinne CHANEAC (Sorbonne University – C'Nano)

Jury:

- Anais LEROUX (Univ. Poitiers – Science & Society)
- Nathalie LIDGI-GUIGUI (Univ. Sorbonne Paris Nord – LSPM)
- Arnaud MAZURIER (Univ. Poitiers – IC2MP)
- Loranne VERNISSE (Univ. Poitiers – Pprime)
- Milena VEROT (CNRS – DR08)
- Isabelle SAGNES (CNRS – C2N)

Chairwoman:
Maéva LUBIN (CNRS – C'Nano)

Music band from Poitiers: Alya

Art & Science Session

© Simon Raffy (LPCNO- INSA de Toulouse)

When art & science meet

Wednesday March 15th, 2023

IMAGE PRIZE AWARD
The official announcement of the winners will take place in Poitiers on Wednesday March 15, during the general public evening organized as part of the C'Nano 2023 congress. ") will be awarded during the Image Awards Ceremony. The images of the winners will also be exhibited on the "Art & Science" stand during the 3 days of the congress.

Organizing committee:
Julie CARIMALO (CNRS – C'Nano); Maéva LUBIN (CNRS – C'Nano); Simon RAFFY (CNRS – LPCNO); Giancarlo RIZZA (CEA – LSI); Julie SAURET (EP – LadHyX, Art & Science Chair).

Jury:

- Giancarlo RIZZA, CEA Researcher at LSI Laboratory – President of the jury
- Maéva LUBIN, CNRS Research Engineer – Communication Officer at C'Nano & Image Prize coordinator
- Simon RAFFY, CNRS scientist Research Engineer at LPCNO Laboratory
- Julie SAURET, Head of communication and project coordination at the Ecole Polytechnique within the Arts & Sciences Chair
- Adèle VANOT, CNRS Research Engineer – Head of media center at CNRS Images
- Valério VINCENZO, visual artist and photographer

For more information, please contact: art-science_cnano2023@services.cnrs.fr

A specific area will be dedicated to discussions on «Art & Science» during the 3-day congress in the posters and exhibition stands area.

Come to see the stands !

Innovation Session

From invention to innovation

Friday March 17th, 2023

This event will be held in French.

10.30 – 11.00 I Experience Feedback
François JEROME (CNRS – IC2MP / INCREASE), CNRS 2021 Innovation Medals

11h00 – 12h30 I Roundtable
How stimulating innovation and partnership between academic laboratories and industrials ?

Chaired by Thomas ROGAUME,Vice President of Poitiers University, in charge of Research, Innovation & economic partnerships

Invited persons :

- François JEROME (CNRS – IC2MP), Director of INCREASE international consortium
- Cyril DUPEYRAT (Safran Electronics & Defense) & Fabien PAUMIER (Univ. Poitiers – Pprime), Dir. LabCom PRIMEO
- Matthieu GABARD, Dir. pôle accompagnement Technopole Grand Poitiers
- Cédric LEBAILLY (CNRS – SPVR), Dir. Service Partenariat et de la Valorisation de la Recherche (ENSMA, Univ. Poitiers, CNRS)

Organizing Committee:
Julie CARIMALO (CNRS – C'Nano) ; Cédric LEBAILLY (CNRS – SPVR)

A specific area will be dedicated to discussions on Technology Transfer during the 3-day congress in the posters and exhibition stands area: come and visit us!

For more information, please contact: innovation_cnano2023@services.cnrs.fr

A specific area will be dedicated to discussions on Technology Transfer during the 3-day congress in the posters and exhibition stands area.

SATELLITE EVENT

- 1st Annual Scientific Meeting of PEPR Electronics

PEPR-ELECTRONICS

1ST ANNUAL SCIENTIFIC MEETING

Tuesday March 14th, 2023

Upstream the C'Nano congress, the PEPR Electronics is organising its first annual scientific day on Tuesday March 14th 2023!

This meeting will mobilize all the scientific leaders (CNRS/CEA/Universities) of the targeted projects and concerted actions of the PEPR Electronics, researchers and lab's directors involved in this program, and French industrials in the field. It will be an opportunity to briefly present the content, the roadmaps and the investments of the projects supported by the PEPR. It will also be a place to exchanges on common issues related to PEPR topics.

More information in French on : *https://pepr-elec.sciencesconf.org*