Sustainability and eco design of nanomaterials

Wednesday March 19th

10:30 A.M. - 12:30 A.M.

ROOM CD

Program of the session :

Chair: Emmanuel FLAHAUT

HOUR	NAME	TITLE
10:30	**Simon CLAVAGUERA LITEN - CEA**	**Operationalization of Safe- and Sustainable-by-Design Approaches for Advanced Materials: A Journey from Nanomaterials to Plastics**
11:00	Jamie SILK LMGP - Grenoble INP	Life Cycle Assessment of Metal Oxide Nanowires for Applications in Passive Atmospheric Water Collection
11:15	Gustavo Vinicios MUNHOZ GARCIA GET - CNRS	Glyphosate-based nanosystems: from design using natural polymers to toxicity in target and nontarget organisms
11:30	Chiddharth MUTHURAJ LCMCP - Soronne Univ.	Solvent free sol-gel strategy: The road to sustainability for the synthesis of oxides and mixed oxides based heterogeneous catalysts
11:45	Lucas NOLANN LERMaB - Univ. Lorrainne	Nanolignins for innovative materials
12:00	Gaëlle CHARRON MSC - Univ. Paris Cité	Surface enhanced Raman Scattering: the winding road from a fundamental phenomenon to action research
12:15	-	-

Simon CLAVAGUERA (CEA - LITEN, Grenoble), télécharger le résumé

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Short biography

Dr Simon Clavaguera graduated in 2004 in chemistry and chemical engineering (ENS Chimie Montpellier). He then received his Ph.D. in chemistry at the University of Montpellier in 2007 on the development of chemical sensors for explosives detection. After working as a postdoctoral fellow with Professor Yves Rubin at the University of California Los Angeles on the chemistry of fullerenes, he joined the Atomic Energy Commission in Grenoble, France in 2009. After working a decade on developing methods and devices for exposure assessment to harmful substances and airborne particles, he contributed to the implementation of Safe- and Sustainable-by-Design approaches towards the development of advanced materials for energy. He also gained expertise on the transformation of materials that can lead to the release of substances of concern during their life cycle, by measuring pollutants in different environments (air, water, soil) and proposing technological solutions to protect people and the environment. He coordinates the European project SURPASS on Safe- and Sustainable-by-Design Plastics and leads the Measurement, Safety and Sustainability Laboratory of CEA Liten.

Operationalization of Safe- and Sustainable-by-Design Approaches for Advanced Materials: A Journey from Nanomaterials to Plastics

The transition to Safe- and Sustainable-by-Design (SSbD) approaches is crucial to innovate on advanced materials assuring they are both safer and more environmentally sustainable. This keynote explores the operationalization of the SSbD framework developed by the European Commission's Joint Research Centre, highlighting its role in minimizing environmental impacts and supporting a zero-pollution, climate-neutral economy. Examples from nanomaterials to plastics will illustrate how SSbD principles can be integrated through eco-innovation and life cycle thinking. The Labex Serenade project demonstrated a Safer-by-Design (SbD) approach in mitigating exposure risks by assessing release scenarios on a TiO_2-based photocatalytic mineral paint. Findings showed that SbD coatings reduce nanoparticle release and toxicity during accelerated aging. Building on this, the Horizon Europe-funded SURPASS project applies SSbD principles to plastics, developing materials for the building, transport, and packaging sectors. These innovations aim to significantly reduce plastic waste while improving sustainability in key industries. A structured assessment process identified release hotspots along the polymer life cycle, followed by experimental verification of substance release. Hazard assessments, combining the exploitation of existing toxicological data, QSAR modeling, and in vitro assays, addressed data gaps related to cytotoxicity, inflammation, oxidative stress, genotoxicity, epigenetics, endocrine disruption and acute aquatic toxicity. Environmental impacts were evaluated using Life Cycle Assessment, while Life Cycle Costing provided economic insights. A unified scoring system integrating hazard, exposure, environmental, and cost assessments was developed to guide decision-making in polymer design. These efforts contribute to the creation of a digital tool that will help SMEs and industry stakeholders in implementing sustainability-driven strategies fostering innovation in Safe- and Sustainable-by-Design Plastics.

Keywords

SSbD framework, Eco-innovation, Sustainability, Life cycle thinking, Tools

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References

Caldeira, C., et al., “Safe and sustainable by design chemicals and materials - Framework for the definition of criteria and evaluation procedure for chemicals and materials,” JRC Technical Report, 2022, doi: 10.2760/487955
Caldeira, C., et al. « Safe and Sustainable by Design chemicals and materials: Application of the SSbD framework to case studies », JRC Technical Report, 2023, doi: 10.2760/329423.
Abbate, E., et al. « Safe and Sustainable by Design chemicals and materials - Methodological Guidance », JRC Technical Report, 2024, doi: 10.2760/28450.

Poster Session

NANOCHEMISTRY & NANOPARTICLES/NANOBIOSCIENCES & NANOMEDECINE /NANOMATERIALS FOR ENERGY/ SUSTAINABILITY AND ECO DESIGN OF NANOMATERIALS

N° POSTER	TITLE	NOM	Prénom
31	Plasmon-induced thermo-polymerization of PETA in presence of various thermal initiators	BASTIDE	Mathieu
32	Green synthesis of curcumin based nanoparticle	BASU	Surita
33	Synthesis of Polyvinylpyrrolidone nanocomposite with palygorskite for application in water-based drilling fluids	DALMONEKI	Anna Clara
34	Carbon supported metal oxides nanoparticles and their applications in biomass valorization	DJELLALI	Ali
35	Synthesis of Polyacrylamide/Palygorskite Nanocomposites for Application in Water-Based Drilling Fluids	GOMES	Ana Beatriz
36	Re(CO)-based silica-nanoparticles as multimodal probes for bio-imaging	KAUFFELD	Willem
37	Chiral CdSe/CdS Nanonails	KUZNETSOVA	Vera
38	Towards large-scale production of Cobalt nanorods	LISOIR	Emma
39	Synthesis and Evaluation of PAMAM G0.5 Dendrimer as a Swelling Inhibitor Additive for Clays in Water-Based Drilling Fluids	LOPES/SPINELLI	Grazielle/Luciana
40	Plasmonic nanoclusters synthesized by a multi-step colloidal approach	ROMANUS	Martin
41	Influence of CuInS2 crystalline structure on the synthesis of CuIn1-xFexS2 quantum dot by cation exchange	ROUX-BYL	Céline
42	Chirality in Zinc Oxide nanoparticle synthesis	SARTOR	Valerie
43	Application and evaluation of core-shell nanocomposite using silica nanoparticles and AM/AMPS/DMDAAC/AAC tetrapolymer	SPINELLI	Luciana
44	Design of efficient nanocatalysts for H2 release from boranes and silanes	THIBAULT	Maxime
45	Influence of crystalline structure on the acoustic vibrations of elongated nano-objects	VERNIER	Charles
46	Chemistry and biological effects of germanium oxide nanoparticles	VIKRAMAN	Haribaskar
47	From laser-synthesized nanoparticles to innovative medical devices	AL KATTAN	Ahmed
48	Ultra-small Superparamagnetic Iron Oxide Coated Phosphonate-based Ligand for MRI Application	CHE DJI	Lyns Verel
49	Magnetic hyperthermia tumor ablation and tumor microenvironment modulation monitored by optical imaging	COSTE	Henri
50	Synthesis of iron oxide nanoparticles and magnetic properties tuning by temperature cycling: towards fine control of crystal phase and size distribution	HUEZ	Cecile
51	Hybrid plasmon-semiconductor nanoparticles for charge or resonant energy transfer based dynamic phototherapy	JEFFRIES	Beatrice
52	Re(CO)-based silica-nanoparticles as multimodal probes for bio-imaging	KAUFELD	Willem
53	Force nanosensor development for measuring mechanical stress exerted by living cells	LACROIX	Noemie
54	Combination therapy using nanoheaters and CAR-T immunotherapy on 3D tumor models	LEINEBO	Charlotte Amalie
55	Red-blood-cell-membrane-coated polymer micelles/vesicles as biomimetic nanoassemblies for potential photocatalytic cancer therapy under hypoxia	MA	Yandong
56	Vivoptic, a preclinical optical imaging platform for the evaluation of diagnostic and therapeutic strategies	MORNET	Stéphane
57	On the Roles of Polymer Chemistry, Kinetics, and Mixing in the Assembly of Loaded Polymer Nanoparticles	REISCH	Andreas
58	Digital colorimetric biosensing on gold-DNA origami nanostructures	ZHANG	Zixiao
59	Cu Isotopic Fractionation Following Foliar uptake	CALAS	Aude
60	New process "Multi-Dip Coating" applied for biological statistical analysis of Antimicrobial Surfaces	CHARLIAC	Jérôme
61	One step synthesis using laser pyrolysis of nanostructured carbides molybdenum catalysts for hydrogen production	RIO	Simon
62	Study of the reactivity of Fe(0) nanoparticles towards ammonia	ZAMBLE	Christian Irie
63	Chemical Passivation of GaN Nanowires for the Development of Innovative Photocatalysts	ZORAI	Amel