Keynote Speakers

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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.

Title of Oral Presentation

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

Keywords (5 words max)

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

Abstract of Oral Presentation

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.

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