**EU CHEMICAL STRATEGY FOR SUSTAINABILITY: INTRODUCING SAFE AND SUSTAINABLE BY DESIGN CHEMICALS, MATERIALS AND PRODUCTS**

**D.A. Sarigiannis1,2,3\*, S. Karakitsios1,2, A. Gypakis4**

1 Aristotle University of Thessaloniki, Department of Chemical Engineering, Environmental Engineering Laboratory, Thessaloniki, Greece

2 HERACLES Research Center on the Exposome and Health, Center for Interdisciplinary Research and Innovation, Aristotle University of Thessaloniki, Greece

3 School for Advanced Study (IUSS), Science, Technology and Society Department, Pavia, Italy

4 Ministry of Development, General Secretariat for Research and Innovation, Athens, Greece

*\* sarigiannis@auth.gr*

**ABSTRACT**

In December 2020 the European Commission issued its new chemicals strategy for sustainability (CSS) seting out a vision for the EU chemical policy, to strive for a “toxic-free environment” and reduce environmental pollution to zero (the Zero Pollution ambition). The reduction of the net negative impact on ecosystems and people without burden shifting between different sectorial policy objectives, requires a clear departure from current practice. We need to move towards a more holistic approach, enabling the assessment of combined risks (by improving the methods for chemical testing and predictive toxicology) caused by exposures from different sources (by improving exposure assessment) under different regulatory frameworks, following the “one substance one assessment” principle. More interestingly for sustainable chemical innovation, the other key pillar of the CSS is the transition to chemicals that are Safe and Sustainable-by-Design. The SSbD concept is defined as a process to accelerate widespread market uptake of new and alternative chemical products and technologies that deliver greater consumer confidence in their safety, environmental and societal benefits and advance the transition towards a circular economy and climate-neutral society. Currently SSbD is at the core of institutional, process and technological systems innovation in the chemical industry and in chemical engineering in Europe and it has been integrated in the national research and innovation agenda in Greece.

In this context, the most important action of Horizon Europe, the new framework instrument for research and innovation in Europe, in chemical engineering innovation to date is the creation of the EU-wide partnership on assessment of the risk of chemicals (PARC). PARC is an EU alliance bringing together 200 public institutions aiming to support the implementation of the “Green Deal”, the “Chemicals Strategy for Sustainability Towards a Toxic-Free Environment (CSS)”, including the “Industrial Strategy”, and the “New Circular Economy Action Plan”. Even though the criteria defining specifically the SSbD concept are currently being coined by the European Commission and are expected to be issued in October 2022, the need to move towards the operationalisation of SSbD is a key objective of PARC. Thus, a SSbD toolbox integrating tools for safety and sustainability assessment coming from different policy areas and strategies as well as new tools developed in PARC is being designed. Examples of the SSBD methodology on major industrial chemicals such as plasticiser (chemicals existing in the market and their alternatives) and nanomaterials will be demonstrated, including a broad array of interconnected methodological tools that allow the refinement of the assessment of chemical risks, including their entire life cycle.

**KEYWORDS:** Industrial chemicals, safety, sustainability, circular economy