**SSbD approaches for Cosmetic Application**

Stefano MANFREDINI - *Ambrosialab Srl, Ferrara*

In recent years, there has been a growing awareness of environmental issues, which has had a significant impact on the cosmetics sector. Sunscreens, in particular, have come under scrutiny due to concerns about the ecotoxicity of organic ultraviolet (UV) filters. As a result, there is a growing trend among developers to shift towards using inorganic filters as alternatives. However, this approach comes with challenges, as inorganic filters can be difficult to spread and may result in low compliance from consumers. To address this issue, we have proposed a safe-by-design approach based on evaluating the morphology of the inorganic material. Often, the actual dimensions of the inorganic filters do not match the characteristics declared by the producers, as the material tends to aggregate. By carefully selecting and combining appropriate inorganic filters, we aim to formulate Cosmetic Products with a Natural and Sustainable Connotation (CPCNS) that meet the required standards. This approach ensures that the sunscreen products are effective, safe, and environmentally friendly, while also promoting sustainability in the cosmetics industry.

**Text**

The global nanotechnology sector faces a significant challenge in creating safe and functional engineered nanomaterials (ENMs) and nano-enabled products (NEPs). The SbD4Nano European project aims to establish a comprehensive e-infrastructure to facilitate collaboration among supply chains and develop optimized SbD setups through case studies.

Environmental concerns have also affected the cosmetic sector, especially regarding sunscreens. Both organic and inorganic ultraviolet (UV) filters, particularly in their nanoscale form, have come under scrutiny for their potential ecotoxicity and tissue penetration. The research endeavors to assess the risks and explore strategies to minimize potential harm to consumers.

Ambrosialab's case study focuses on using ENMs as UV filters in cosmetic products. The main objectives include evaluating the safety implications of their incorporation in formulations. The project's surface engineering approach aims to reduce (eco)toxicity, exposure, and release of active materials. This information serves as a reference for validating the e-infrastructure.

The "safe and sustainable by design" approach involves assessing the morphology, efficacy, safety, and eco-sustainability of inorganic materials at the R&D stage. Compliance with the COSMOS (Natural) Standard, feasibility of new "inorganic (UV) active" molecules, and adherence to regulatory requirements concerning nanomaterials in cosmetics are additional aims.

In conclusion, the study provides valuable insights into the safe and effective use of nanomaterials in cosmetics. By meeting standards, regulations, and exploring alternatives, the project successfully designs and offers natural and sustainable sunscreen products that fulfill consumer demands while safeguarding human health and the environment.