SUNSHINE
Safe and Sustainable Design for Advanced Materials

www.h2020sunshine.eu

LAURENTIA

Laurentia Technologies is a SME specialized in R&D of new materials and technologies capable of supporting companies and research centers to grow through innovation. It has a relevant capacity in developing and manufacturing nanomaterials to add new functionalities and improve the performance of several products from different sectors (Materials, Detergency, Agrifood, Cosmetics). In the team there are experts in coatings by sol-gel technology and scale-up processes.

Case study objectives

- Develop anti-stick coatings on aluminum molds for bakery applications and alternative to PTFE (Teflon) which requires strict controls on PFOA release and periodical re-applications
- Increase safety and sustainability by replacing PTFE with sol-gel coating developed in a SSbD perspective and based on inert and thermal conductive core-shell nanoparticles of SiC-TiO2 or SiC-SiO2
- Improve the overall coating performances and durability to reduce the re-coating cycles and the associated process costs
- Assess how the nanomaterials are released from the different life cycle stages and transformed into biological and ecological compartments
- Evaluate the environmental impact of the nanoenabled coating by means of LCA analysis addressed to compare PTFE with the SSbD alternatives.

Materials

- Core-shell nanoparticles based on Silicon carbide core and titanium dioxide or silicium dioxide shell.

Functional performance

Samples exposed to 25 bakery cycles: good anti-stick performance for the coating with MCNM; traces of burnt bread for the coating without MCNM.

Safety goals

- Replace PTFE coating to overcome the risk associated to migration phenomena of PFOA from the mould into food
- Improve the binding of nanoparticles into the coating to mitigate nanoparticles migration phenomena from the mould into food
- Develop SiC-based nanoparticles by replacing TiO2 with SiO2 as shell component to prevent TiO2, reason of concern for EFSA evaluation, from food contact
- Evaluate the MCNM physicochemical transformation throughout the whole life-cycle stages and in relevant fluids to support the (eco)toxicological characterisation
- Optimize the process steps identified as hot spots to mitigate the occupational exposure and risks.

Sustainability goals

- Application of LCA (Life Cycle Assessment), LCC (Life Cycle Costing) and S-LCA (Social Life Cycle Assessment) methodologies to the MCNM and the nano-enabled product containing MCNM
- Mitigation of the crucial points identified by the LCA, LCC and S-LCA results
- Improve the coating durability to abrasion and thermal solicitations to reduce re-coating frequency and the associated environmental impact and costs
- Enhance the thermal conductivity of the coating to promote more efficient and cost-effective cooking cycles.

"The multicompoment nanomaterials used in developed coating allow to extend the durability of bakery molds from 6 months to 1 year (2.500 bakery cycles)."