

TORNADO: New routes of safe and sustainable by design water and oil repellent biobased coatings

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Abstract:

Due to a variety of unique properties, including excellent water and oil repellence, high thermal stability, and excellent surfactant properties, per- and polyfluoroalkyl substances (PFAS) are used in a broad range of consumer products and industrial applications. However, PFAS can undergo partial degradation under certain environmental conditions, resulting in the formation of other PFAS with even greater impact, such as perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). Moreover, long-chain PFAS accumulate in humans, animals, and sediment/soil, while short-chain PFAS accumulate in the environment. Based on concerns regarding the high persistence and the lack of knowledge on toxicological profiles of many PFAS, it has been argued that the production and use of them should be limited [1], [2].

TORNADO project aims to contribute to the transition to a safe circular economy by influencing how products should be designed, produced, used or treated at their end-of-life. New organic and hybrid PFAS-free coatings with water and oil repellence will be developed – following Safe and Sustainable by Design (SSbD) criteria – for three main applications (packaging, textile, and kitchenware). The first goal is to develop two new functionalized bio-monomers with polydimethylsiloxane (PDMS) and polyhedral oligomeric silsesquioxane (POSS). Then, the monomers will be used to synthesize novel organic and hybrid coatings by two industrial-scalable technologies. The coatings will be validated to obtain a performance at least identical to PFAS coatings in terms of water and oil repellence and tested according to the main textile, packaging, and kitchenware specifications. TORNADO consortium is composed of 14 partners from EU countries (Spain, Italy, France, and Sweden) and non-EU countries (Turkey), including research organizations, large companies, and SMEs.

Next Technology Tecnotessile (NTT) is involved in technical activities for the application and the validation of TORNADO coatings on textile-based substrates. In particular, NTT – leader of WP3 – will use computational tools to verify mechanical and functional properties (barrier to oxygen and water vapour) of textile and packaging prototypes pre- and post-coating. The main goal will be the creation of a computationally solvable

mathematical model, which will be validated by experimental tests.

Keywords: Coating and Films, Safe and Sustainable by Design (SSbD), Water and Oil Repellence, Textile, Packaging, Kitchenware.

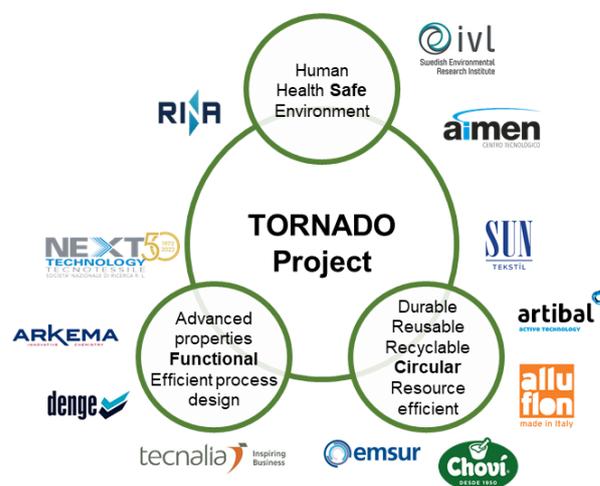


Figure 1 TORNADO Project: Summary of the objectives.

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