

## The EC4SafeNano PROJECT AND THE CASE STUDY OF SURFACE CHEMICAL TRANSFORMATIONS OF NANO-TiO<sub>2</sub> SAMPLES UPON AGEING

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A central challenge to ensure the sustainable production and use of nanotechnologies is to understand and effectively control the risks along the industrial innovation value chain. Knowledge about nanotechnology processes and nanosafety issues (hazards, fate, risk...) is growing rapidly but the effective use of this knowledge for risk management by market actors is lagging behind.

EC4SafeNano (*European Centre for Risk Management and Safe Innovation in Nanomaterials and Nanotechnologies*) promotes a harmonized vision of expertise in risk assessment and management for the public and private sectors to enable the safe development and commercialization of nanotechnology.

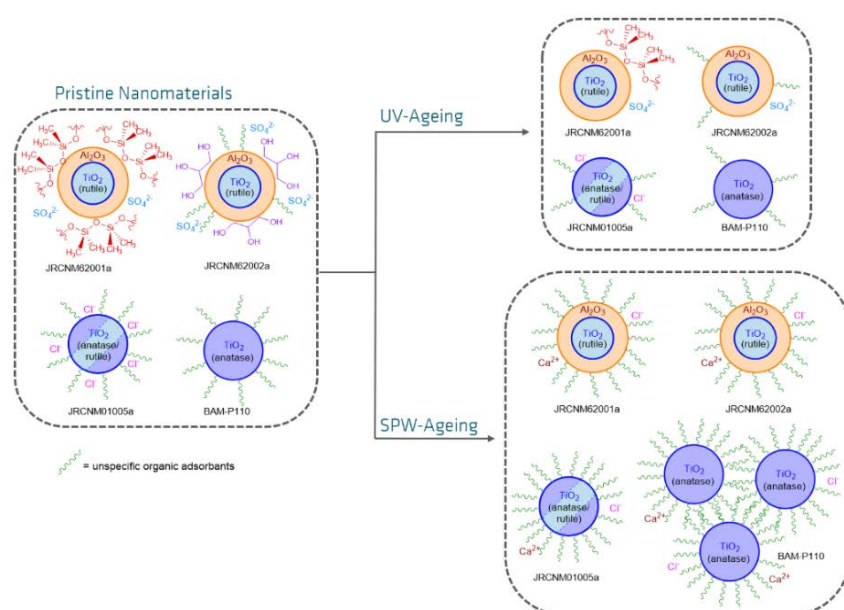
EC4SafeNano is operated together by major European risk institutes with the support of numerous associated partners, gathering all stakeholders involved in Nanomaterials and Nanotechnologies (regulators, industry, society, research, service providers...).

In a case study the surface chemical transformations upon 2 different ageing procedures (long-term UV irradiation or swimming pool water) of a representative set of titanium dioxide nanoparticles has been investigated. The materials have been analyzed by various analytical techniques. Each method addresses different aspects of the complex endpoint surface chemistry. The multi technique approach allows evaluation of the capabilities and limitations of the applied methods regarding their suitability to address the endpoint surface chemistry and their sensitivity to identify even small surface chemical transformations.

### Results:

- To obtain a comprehensive picture, it is insufficient to concentrate on a single analysis technique.
- By using time-of-flight secondary ion mass spectrometry (ToF-SIMS) in combination with principal component analysis (PCA) it was possible to identify even subtle changes in the surface chemistry of the investigated materials.
- A general trend that was observed for the UV-aged samples is the decrease of organic material on the nanomaterial surface.

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Schematic visualization of the surface chemical transformation caused by UV-weathering and swimming pool water (SPW) ageing.

