Selection of nanotechnology enabled products for nano-release assessment throughout their life cyle in the nanosolutions project

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Abstract

The hazard evaluation of engineered nanomaterials (ENMs) needs to take into consideration that the initially synthesized ENMs will not remain unaltered during their life cycle. The intentional introduction of surface modifications to ENMs is a common practice prior to the incorporation of these ENMs in other products. Later, during the use or end of life phases, other transformation processes may take place, so that if ENMs are released they may share few characteristics with the initially synthesized ENMs. Possible changes include surface coating, irreversible embedding in matrices, dissolution, agglomeration and aggregation, surface charge modification, whereas factors underlying the occurrence of these changes include aging, mechanical stress, chemical stress and/or interactions with biota in the environment in most cases in a combined manner.

The main goal of the present work has consisted on the selection of nano-enabled products and the evaluation of their life cycle to study the release of ENMs in different phases, within the framework of the NANOSOLUTIONS FP7 European research project. This project ultimately aims at identifying and elaborating those characteristics of ENMs that determine their biological hazard potential by providing a means to develop a safety classification of ENMs.

According to the specific processes undergone by the selected applications, the life cycle of the ENMs -beyond manufacturing stage- has been evaluated. Thereafter, the life cycle stages that are most likely to result in the transformation of the ENMs and/or to result in the release of ENMs have been identified prioritizing normal use conditions (releases generated in accidental scenarios have not been considered). The outcome of present work has enabled the definition of realistic laboratory scaled simulation processes to be undertaken in the execution of the project.

Preliminary findings on nanoadditivated commercial fabrics are also introduced.

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