bridging the gaps
Sustainable Urban Spaces

Little Green Things

Nanotechnology and Sustainability Sandpit

UCL

Duracoat: Using nanoscience to protect wood

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The aim and scope of the study

The study examines the findings of research so far on the technological applications, environmental impacts and potential risks emanating from the use of ENOs in wood-protective coatings. It presents and discusses the technological effects of nanosized particles in wood coating systems and considers potential impacts and risks from the moment of application/treatment until the end of the products' useful life (up to and including disposal). The aim is to identify potential gaps in the literature and highlight and prioritize areas for further research.

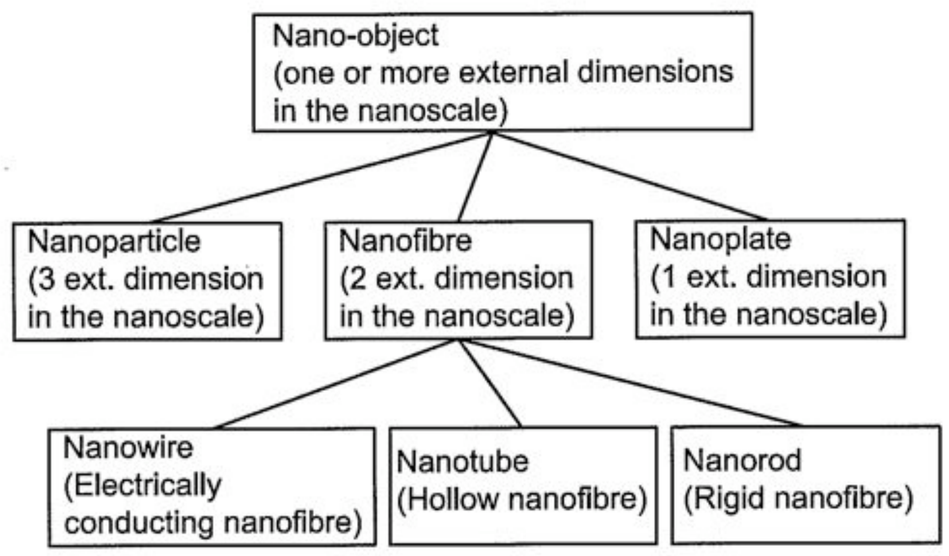

Figure 1: Hierarchy of terms related to nanoobjects (ISO/TS-27687, 2008)

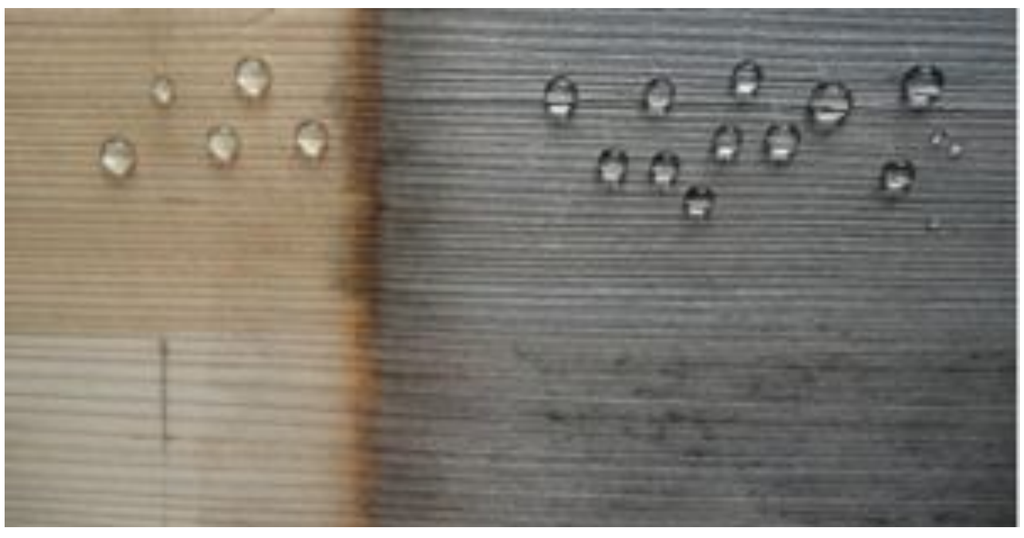

Figure 2: Effect of organofunctional silanes on surface hydrophobicity (Source: Empa)

ENOs in wood coating applications

Wood coating systems aim at the improvement of at least one disadvantageous wood property such as biodegradability, combustibility, UV-degradability or hygroscopicity. Wood coatings comprising ENOs with unique properties can significantly prolong the service life time of wood building components or protect the wood from mechanical abrasion and surface erosion.
The study explores the current state of knowledge and future areas of research regarding the use of nanocoatings in UV-protection, hydrophobation/easy-to-clean, hardness and antimicrobial applications.

Risk and Life cycle assessment for ENOs

Plenty of validated toxicity and ecotoxicity tests suitable for chemicals are in use today, however much work is required to optimize these for nanomaterials. These are often poorly understood in terms of their behaviour in living organisms and in soil and water. Of essential relevance is to enhance knowledge of the life-cycle of nanotechnological products, from production, throughout their use and until their disposal (Krug 2008). Final goal should be to summarize ENOs into classes with similar effects on health and environment. Suitable reference parameters need to be determined (e.g. mass, particle number, size etc.) in order to allow comparative analysis and interpretation.

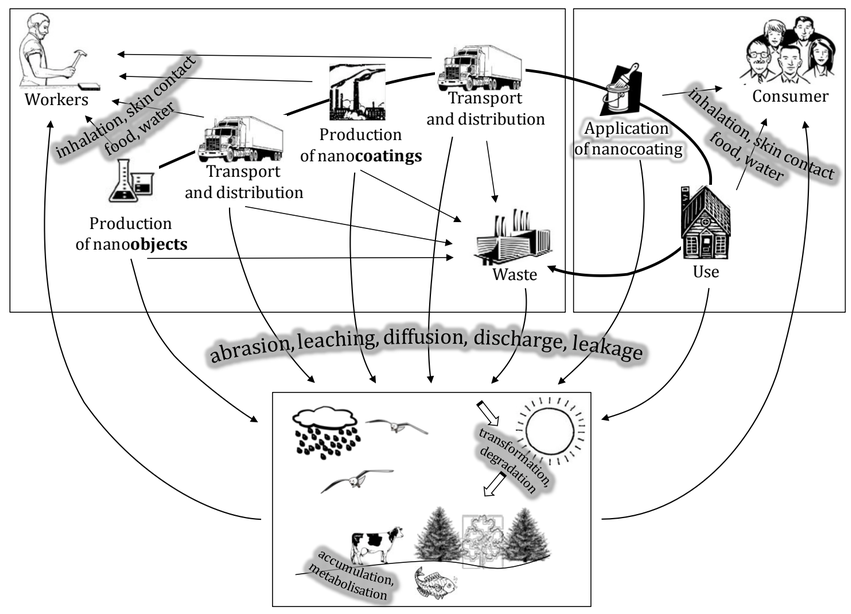

*Figure 3:*The life cycle of nanomaterials in surface coatings and possible environmental impacts (adapted from Royal Society, 2004)