

# Six steps to succeed with safe nanomaterials

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The possibilities with nanomaterials are vast, however safety should not be forgotten. How should the limit values be set when size affect the material properties? There is a risk that “nano” becomes equal to “dangerous”, writes four scientists.

The development of new materials with nanostructures designed on atom level is rapidly progressing and can contribute with new strategies to solve today's big challenges related to health and environment. Already now, nanomaterials are used to do strong and light products, in cosmetics and to direct drugs to different target organs during treatment of cancer. Within a not distant future many of our everyday products can contain components of nanomaterials.

The exceptional small size of nanomaterial means that a substance can get entirely new qualities when it appears as a nanomaterial compared to in its bigger, “normal” form. Material in nanoscale is being developed with the purpose of using these qualities. It may apply, for example, electrical, optical, magnetic, chemical or mechanical (strength, flexibility, etc.) characteristics.

A type of nanomaterial that can revolutionize our everyday lives and increase the usability of climate smart forest raw materials is called nanocellulosa. Swedish research leads this development. When possibilities are big, there is always a risk that safety is forgotten. We have seen it before. When new substances such as brominated flame retardants in televisions and fluorinated waterproofing layers of textiles were launched in our daily reactants, the persistence and toxicity of substances could cause environmental and health problems.

When new substances such as brominated flame retardants in televisions and fluorinated waterproofing layers of textiles were launched in our daily reactants, the persistence and toxicity of substances could cause environmental and health problems. Today, we are forced to put large resources on steering away from these hazardous chemicals.

Which traces will our new nanomaterials leave on the environment? How is our health affected by these extremely small structures? Does manufacturing and waste management cause problems related to our work environment? The last 70 years we have developed methods for risk assessment of chemicals with standardized tests. However, we still don't know which testing requirements should be made before introducing new nanomaterials. Which test methods is suitable to study health risk with these kinds of substances? How can limit values be set when researchers can't agree on how to best describe the dosage of these substances?

Is it the weight, the surface or the length that is most relevant to base risk assessments on? The questions accumulate and at the same time the risk that increases that "nano" will be perceived as equal to "dangerous". It is possible that this will obscure the vision to handle real problems with hazardous substances.

As part of the environmental objective a "Non-toxic Environment", the government has now taken the initiative to establish a Swedish platform to coordinate and convey knowledge about nano security between different actors in society (authorities, academia, industry and organizations). We have listed

six areas of knowledge where we believe that the new platform can be important for developing Swedish nano-security.

1. Knowledge of validated methods for identifying and testing nanomaterials
2. Knowledge of where and how nanomaterials are used in society.
3. Knowledge of the effects of nanomaterials on humans and the environment, as well as how they interact with their environment.
4. Knowledge of risks for those who professionally work with nanomaterials.
5. Knowledge of the possibilities and risks of nanomaterials based on principles of circular economy, with focus on waste management and recycling.
6. Knowledge of how implementation of laws and regulations works and which parts that needs to be better to strengthen the development of safe nanomaterials.

No actor can do these tasks alone and therefore it is positive to create a structure for cooperation. It is crucial for Swedish companies that there is good coordination nationally without special solutions for special cases.

Many European countries have for several years overseen a strategy to coordinate information on security research and innovation research on nanomaterials. Swedish companies need to be at the forefront of an international market, starting from the principles of circular economy.

For Sweden to contribute to and influence the development of safe nanomaterials, we need to take an increasing part in international work, and there too, cooperation is crucial.

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