

What's 'nano' doing in the waste?

In brief

- An increasing number of products contain nanomaterials which end up in the waste sooner or later. To this day, their effects are still unknown.
- There is hardly any information on substances and quantities of nanomaterials used in mass products.
- This poses challenges for both Austrian waste management and legislation.
- Proposed solutions include the introduction of a standardised register for quantities of nanomaterials in products, consumer-friendly labelling and control of work safety in the waste sector.

What is it about?

For many years, engineered nanomaterials (ENMs) have been included in the production of everyday products and have now started to end up in landfill and waste water. Current examples of such products are nano titanium dioxide in sunscreens or carbon nanotubes in tennis rackets. Around the world and in Austria, the number of products containing nanomaterials has steadily increased.

Because of their small size of only a few millionths of a millimetre, nanoparticles have specific properties which make them interesting for their application in certain products. However, their chemical reactions differ from the ones of bigger particles of the same substance. As a result, nanoparticles may adversely affect the environment, e.g. within groundwater or soil. In addition, in sufficient quantities, they may also pose a risk to human health, for example when inhaled by staff in waste treatment facilities or when ending up in the food chain.

Current waste management legislation does not include any nanospecific adjustments. Theoretically, nanomaterials are covered by all existing permissible thresholds; but because of their specific properties, their enhanced reactivity and their small mass, these thresholds are set way too high to prove effective.

But which everyday products do contain nanomaterials? What happens to them when they are disposed of? And where do they end up within the waste reclamation system?



Nanomaterials can accumulate in waste water plants and lead to problems within the processes.

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It is difficult to determine whether products do contain ENMs. A mandatory labelling introduced in 2013 by the European Union only covers cosmetic products. For all other product groups, the following applies: As long as the processed substances do not pose a health risk, manufacturers are free to use nanomaterials – without labelling them. Besides, detection of nanomaterials post production is currently difficult as well as costly.

As a result, there is no reliable information on which products contain nanomaterials. Furthermore, information on the exact quantity of specific nanomaterials used in Austria is not available. At best, there are estimations and extrapolations for some materials. Consequently, the waste management system is hardly able to prepare for waste containing nanomaterials. But this is necessary in order to act according to the precautionary principle, because nanomaterials could pose new challenges to the technological equipment of waste treatment facilities.

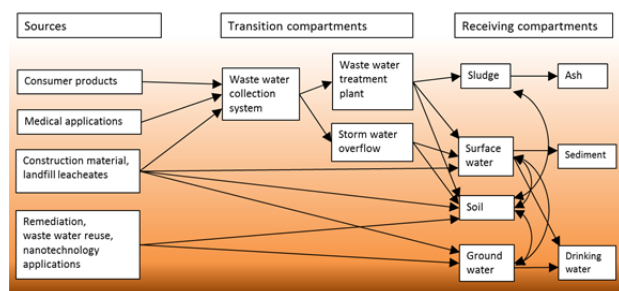
Basic data

Project title:	NanoMia – Nanomaterials in waste
Project team:	Gazsó, A., Fuchs, D., as part of consortium (led by: ABF, University of Life Sciences Vienna)
Duration:	04/2014 – 03/2015
Funded by:	BMLFUW, BMVIT
Website:	oeaw.ac.at/ita/projects/nanomia/overview

Key results

The ITA's database on nanoproducts provides an overview of products in Austria containing nanomaterials. Aside from cosmetic products, for which labelling is mandatory, entries are based on details provided by the manufacturers (e.g. for advertisement purposes) or because the use of nanotechnological procedures during production (e.g. sol-gel process) is known. As a result, only some of the nanoproducts available in Austria are listed.

Out of more than 490 entries, we chose six everyday products which contain one specific nanomaterial each and are used for different purposes. We investigated nano titanium dioxide in sunscreen, nanosilver in interior and exterior wall paints, carbon nanotubes in sports equipment, nanosilica in car accessories such as automotive paint, and nanosilver in disposable cleaning cloths and quantum dots in modern TVs.



Where do nanomaterials occur (sources)? Through which waste and waste water treatment systems (transition compartments) are they released into the environment (receiving compartments)?

The paths of these products in the waste treatment system are all different. Material flow analyses illustrate which ways nanomaterials take within the waste treatment system.

Material flow analyses are an easy way to display such paths and help to identify the points where nanoparticles could potentially be released into the environment (water, soil, air). In particular, they are used to highlight the exact position of nanomaterials within the Austrian waste system as soon as they are used in mass products and during subsequent disposal.

Since there is no reliable data at the moment, accurate calculations of quantities are virtually impossible. For quantum dots, for example, it was impossible to design a material flow analysis because of a lack of data and estimations of quantities used in electronic devices. A lack of data on quantities does, however, pose problems as such data are essential for the assessment of environmental impact.

What to do?

The risk regulation of nanomaterials in waste streams poses new challenges to politicians and society. This means that scientific analytical methods, waste disposal technology and regulatory frameworks must be adapted.

- **More data on nanomaterials in products** is needed. In order to obtain such data, a collection of data on quantities in products or production output is needed, e.g. by means of a standardised EU register or by amending the European chemicals regulation REACH.
- **Working spaces in the waste sector must be safe:** Here, nanomaterials could potentially be released into treatment processes.
- The labelling of nanoproducts should be mandatory and contain more information.
- In order to guarantee **adequate recycling and appropriate waste disposal**, mandatory returns processes would be helpful. This, however, requires sufficient information on nanoproducts being available. Already existing approaches include the extended producer responsibility within the EU's Waste Framework Directive (2008) or the Environmental Product Declaration (EPD).
- Further development of nano-specific analytics and standard procedures for the identification of ENMs in mixed waste is essential. It would be necessary to establish not only standardised methods for the detection of specific nanoparticles, but also methods to analyse the changes of certain properties of nanomaterials throughout their life cycle.
- Existing technologies and measures in the waste sector must be checked for their suitability when dealing with nanomaterials.

Further reading

NanoTrust Dossier no. 043 (2015) Environmentally relevant aspects of nanomaterials at the end of the use phase – Part I: Wastewater and sewage sludge
epub.oew.ac.at/ita/nanotrust-dossiers/dossier043en.pdf

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