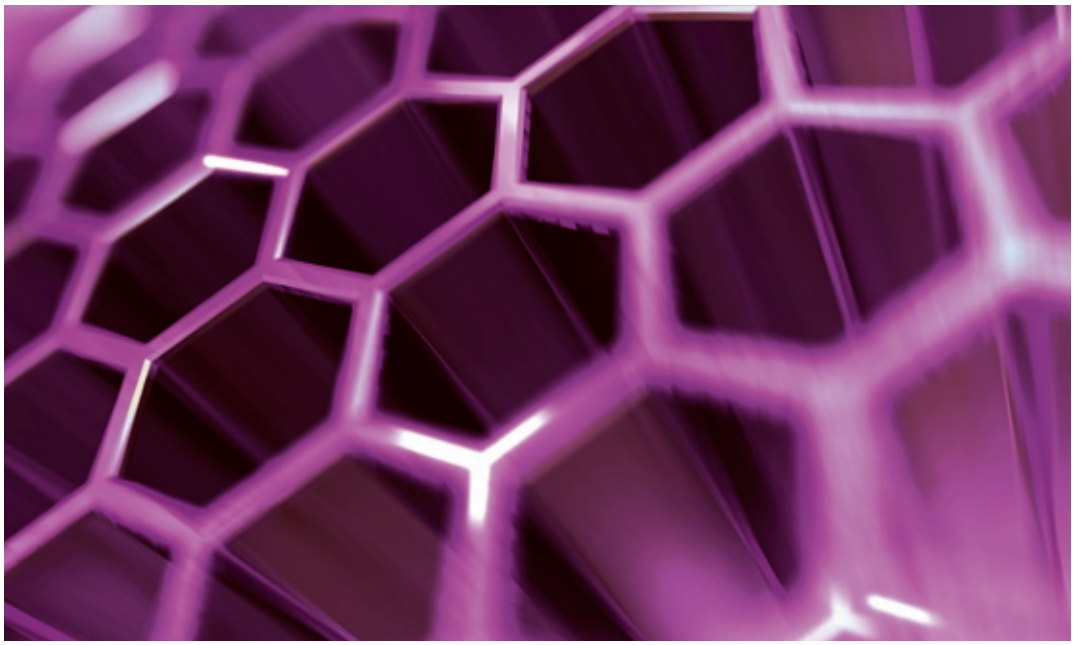
SAFETY OF NANO-PARTICLES



TNO triskelion bv

TNO invests early to support its customers with viable chemical safety strategies under emerging regulations.

Materials on the nanoscale have a large surface-area-to-mass ratio and can therefore become more reactive which changes their properties. Considering their technological and economic potential, the current debate about potential new risks related to nanotechnology is justified, although health and safety regulation is only now under development.

AVAILABLE SERVICES AT TNO TRISKELION

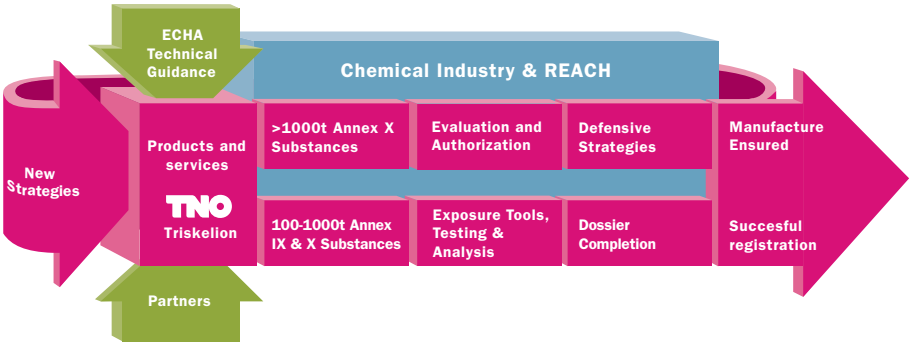
- Analysis and characterization of nano-materials including physico-chemical properties and electron micropcopy
- Adapted toxicology studies with nanomaterials
- Risk assessment and registration, including REACH dossier preparation
- Full exposure assessment and bench-marking of exposure scenarios
- Advice on risk management measures (engineering control and personal protective equipment)
- Safety of food contact materials incorporating nano-technology
- Development of new nano-materials

TOXICOLOGY

TNO has developed test strategies to reliably assess toxicity associated with nanomaterials, using *in silico*, *in vitro* and *in vivo* procedures including:

In vivo

- Dosimetrics under relevant conditions, e.g. via inhalation
- Maintenance of reliable test atmospheres
- Extended pathology (e.g. of central nervous system), haematology and clinical chemistry
- Mechanisms of action (e.g. inflammation)



REACH AND TNO TRISKELION: SUCCESSFUL REGISTRATION 'WITHIN REACH'

The aim of REACH is to describe the safe-use of chemicals throughout the product chain. All High Production Volume Chemicals and priority substances must be registered by 2010 or 2013. TNO Triskelion can assist your company in achieving this with our proven expertise in the fields of risk assessment, registration and testing. With TNO Triskelion, your technical dossiers, exposure scenarios and Chemical Safety Reports are safe in our hands.
The added value of TNO Triskelion's REACH services is based on decades of experience with registration and safety studies for the Chemicals Industry. TNO Triskelion is actively involved in the rgw ongoing work of developing technical guidance for REACH and has broad contacts with ECHA and the EU Member State Competent Authorities.

– Lung deposition, e.g. breathing pattern, broncho-alveolar lavage
– Fibrosis
– Recovery groups

In vitro/in vivo
– dermal absorption
– cytotoxicity assays (*in vitro*)
– gene expression profiling
– genotoxicity assays (micronucleus, COMET)
– inflammatory responses (cytokine secretion by macrophages)
– oxidative potential (cellular and chemical oxidative stress levels)

We have already published adapted toxicology methods for testing various materials – most recently a novel 5-day inhalation study with extended recovery times for testing amorphous silica micro-particles and which is suitable for testing nanoparticles (see Muijser et al. 2007, Arts et al, 2008).

ANALYSIS AND CHARACTERIZATION OF NANO-PARTICLES

Together with our parent company TNO, we operate state-of-the-art equipment for on-line measurement of relevant parameters for exposure to nano-sized aerosols), and specially developed equipment to sample nanosized aerosol for further off-line characterization (e.g. electron microscopy and various chemical analytical techniques).
The helium ion microscope creates a new window on (sub)nano-structured surfaces. At TNO, the first ORION® PLUS Helium ion microscope in Europe is now operational, allowing direct viewing and surface analysis of (sub-) nanometer structures. The instrument is accessible for the scientific community and commercial users.

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