Fraunhofer
IME

FRAUNHOFER INSTITUTE FOR MOLECULAR BIOLOGY
AND APPLIED ECOLOGY IME

RESEARCH AREAS

EFFICIENCY AND ENVIRONMENTAL PROPERTIES OF NANOMATERIALS

CONTACT

Dr. Kerstin Hund-Rinke
Tel: +49 2972 302 - 266
kerstin.hund-rinke@ime.fraunhofer.de

Fraunhofer Institute for Molecular Biology and Applied Ecology IME
Division Applied Ecology
Auf dem Aberg 1
57392 Schmallenberg, Germany
Tel: +49 2972 302 - 0
Fax: +49 2972 302 - 319

Director Applied Ecology
Prof. Dr. Christoph Schäfers

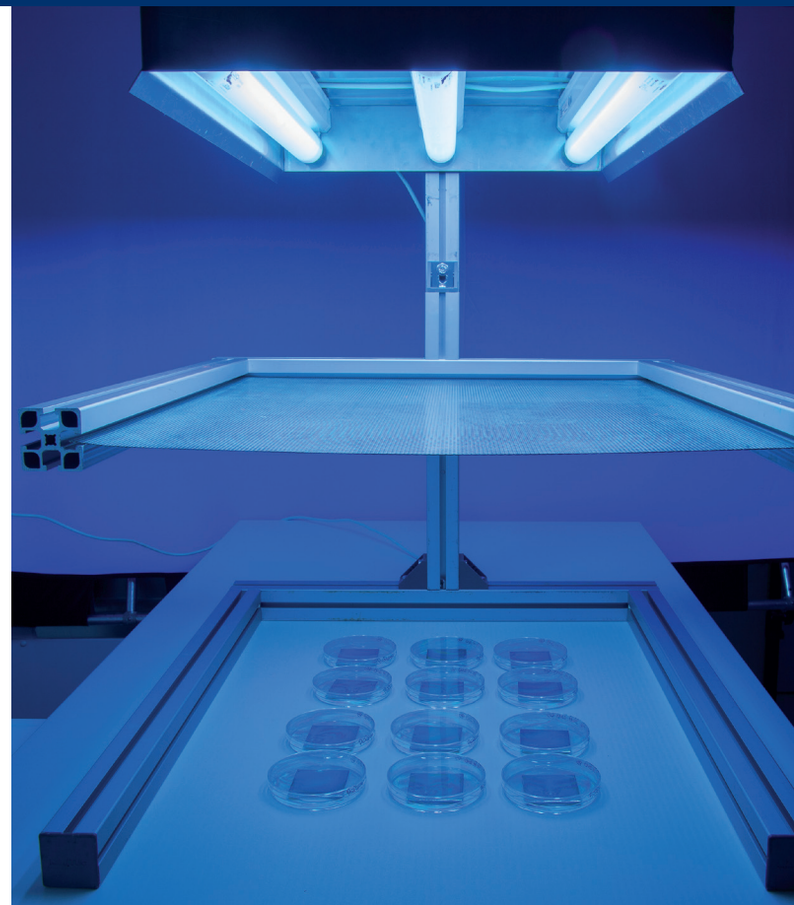
www.ime.fraunhofer.de

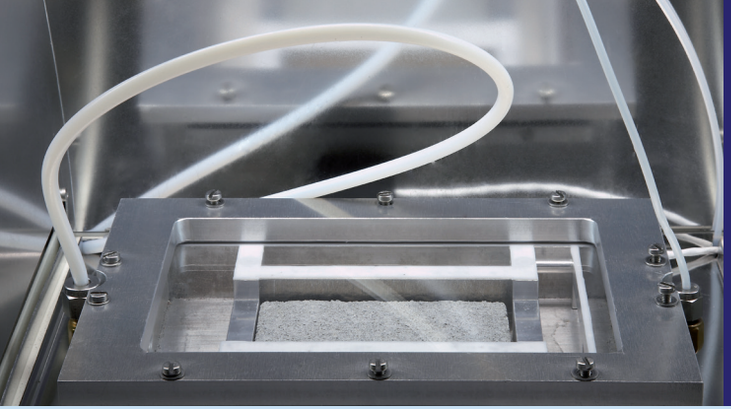
FRAUNHOFER IME
DIVISION APPLIED ECOLOGY

The Fraunhofer IME Applied Ecology Division aims to assess the risk posed by synthetic chemicals and natural substances towards ecosystems, as well as human exposure via contaminated food, feed and consumer products.

Our current topics and business areas are:

- Chemical and Product Safety
- Fate and Effect of Agrochemicals
- Uptake and Metabolism of Agrochemicals
- Food and Feed Safety
- Environmental Monitoring
- Soil and Water Protection





BACKGROUND

Nanomaterials are increasingly used to optimize the properties of a diverse range of products. This increases the likelihood that nanomaterials may have adverse effects on the environment.

Fraunhofer IME deals with both aspects. For example, we carry out measurements to determine the efficiency of products containing nanomaterials with photocatalytic properties. We also characterize the intrinsic properties of nanomaterials and investigate their behavior and potential effects in the environment in order to assess their environmental risk.

Our work reflects our long-standing expertise in the context of developing guidelines for the investigation of conventional chemicals. We have been involved in the elaboration of test guidelines and strategies for nanomaterials from the very beginning so that current developments can be considered in our studies.

Based on the diverse array of methods available at Fraunhofer IME, we provide comprehensive consultation services as well as product-specific investigation programs:

Figure: Measurement of NO-degradation

ENVIRONMENTALLY-RELEVANT PROPERTIES OF NANOMATERIALS

Using tests originally developed for chemicals and adapted for testing of nanomaterials, we investigate the fate of nanomaterials in soils, water and sediments, their impact on aquatic and terrestrial organisms, and their fate and effect in sewage treatment plants. Our strengths include the application of standard tests, for example with algae, daphnids, fish and earthworms, but also the application of more realistic test systems, such as model sewage treatment plants and aquatic microcosms.

EFFICIENCY TESTING IN THE LABORATORY

Our tests to determine the efficiency of nanomaterials focus on the analysis of photocatalytically-active surfaces. Laboratory-scale investigations are suitable for the rapid screening of such properties, the comparative testing of different products, and to determine the optimum conditions for product performance. Our studies are based on ISO Guidelines such as ISO 22197-1 (reduction of nitrogen oxides from the air) and ISO 27447 (detection of antibacterial activity). Potential degradation products can also be identified and assessed.

Figure: Aquatic microcosms

EFFICIENCY TESTING UNDER FIELD CONDITIONS

Field investigations offer the greatest environmental relevance because the climate, air-borne pollutants and precipitation levels reflect the natural conditions found outdoors. Investigations based on such conditions are used to prove the long-term efficiency and stability of different products. The experimental designs will be adapted specifically for each product and the information required from each investigation. We use model calculations to extrapolate our results to fit untested conditions, such as different light intensities and wind speeds.

REPRESENTATIVE SUBSAMPLES OF SELECTED NANOMATERIALS

Defined standard samples are required for the scientific testing of nanomaterials. Fraunhofer IME has carried out the subsampling of nanomaterials under Good Laboratory Practice within the scope of the OECD sponsorship programme*. The relevant materials represented the substance groups CeO_2, ZnO, MWCNT, Ag, TiO_2, SWCNT, SiO_2 and Nanoclay. Subsamples can be requested from the Fraunhofer IME.

* http://www.oecd.org/science/nanosafety/sponsorshipprogrammeforthetestingofmanufacturednanomaterials.htm

Figure: Model sewage treatment plant