

FIELD OF ACTIVITY

## DEGRADATION OF SUBSTANCES AND MATERIALS

The degradation of substances and materials has both economic and safety-related components. New substances and multi-material mixes as well as the use and application conditions of the resulting components have not yet been sufficiently studied in terms of degradation and damage mechanisms. Our focus is on the investigation of mechanical, thermal and corrosive loading on substances under new usage conditions from the fields of metals, ceramics, polymers and their compounds.

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## LIFE CYCLE OF COMPONENTS

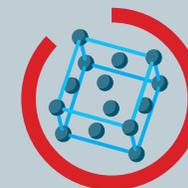
The safe operation of technical systems and processes is of fundamental importance for public technical safety. Safety-related requirements must be realised right from concept creation and construction, through completion and assembly, plus the operational phase, including monitoring and repairs, through to dismantling and recycling. This demands, especially from industry and monitoring organisations, the availability of reliable, credible and realistic testing methods and simulation techniques. Through the development and application of advanced testing methods, we are enabling the safety-related assessment of technical systems and their components, as well as an interdisciplinary failure analysis.

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## MATERIALS AND SUBSTANCES

Considering theoretical and practical aspects, we characterize the properties of materials and substances, to provide a significant contribution to data collection in the field of materials informatics. Main purpose of the results is to ensure safety when handling hazardous substances and to ensure the safe and reliable use of innovative materials (e.g. composite and high-temperature materials, nanomaterials) and manufacturing processes (e.g. additive manufacturing, lightweight construction). The material and substance characterization is based on state-of-the-art, sometimes unique characterization methods ranging from nano- to macroscale. As part of our own research activities, these methods are constantly being improved and further developed as needed.

Sicherheit in Technik und Chemie



FOCUS AREA

## MATERIALS

Checking various test  
methods for material  
identification

201900302

Source: BAM

## KEY TECHNOLOGY FOR A MODERN SOCIETY

# OVERVIEW

Materials science and materials engineering are key technologies in a modern industrial society and represent BAM's conventional core competence. Materials and substances determine the essential properties, functionality, quality and safety of products. Our activities in the focus area Materials are directed at issues of service life, reliability and sustainability where we have decades of proven expertise in materials research and



Determining specific surfaces and void volumes

testing. This expertise is then implemented across all disciplines throughout all focus areas.

Our activities within this focus area include life cycle of components, degradation of materials, materials and substances as well as nanomaterials and their properties.

## FIELD OF ACTIVITY NANOMATERIALS AND THEIR PROPERTIES

Materials on the nanometer scale often exhibit properties which drastically differ from the intrinsic properties of the bulk phase. One focus of the accurate characterization of nanomaterials at BAM lies on the determination of size and size distribution, shape, morphology, the specific surface as well as the surface and bulk composition of nanoparticles.



Measurement of silver nanoparticles with small-angle X-ray scattering (SAXS)

BAM develops and distributes nano-reference materials, provides reference data and explores nanotechnological applications, which allow for novel technical developments by directly exploiting the nano-specific properties. In addition, BAM investigates the hazardous potential and tests the safe handling and application of nanomaterials. This includes the detection of nanomaterials in the environment, monitoring of their emission, ageing, and biological effects, respectively.

# BAM

## **BAM ensures safety in technology and chemistry.**

As a senior scientific and technical Federal institute with responsibility to the BMWi, BAM performs research and testing and provides advice to protect people, the environment and property. All activities in materials science, materials engineering and chemistry focus on the technical safety of products and processes. For this purpose, substances, materials, parts, components and facilities as well as natural and technical systems of economic and societal relevance are investigated, tested and evaluated for safe handling or operation. BAM develops and validates analytical and assessment methods, models and required standards and provides scientifically based services for the German industry in the European and international context.

## **Safety creates markets.**

BAM sets and represents high safety standards in technology and chemistry to develop the successful quality culture of "Made in Germany" throughout Germany and its global markets.