

## ICAMS Departments

- Atomistic Modelling and Simulation
- Scale Bridging Thermodynamic and Kinetic Simulation
- Micromechanical and Macroscopic Modelling
- High Performance Computing in Materials Science

## Advanced Study Groups

- Modelling
- Input Data and Validation
- Processing and Characterization
- Diffusion and Microstructure Analysis

Interdisciplinary Centre for  
Advanced Materials Simulation

Materials modelling  
across the length scales

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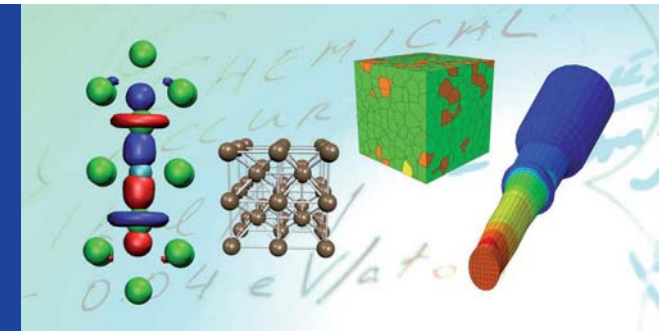
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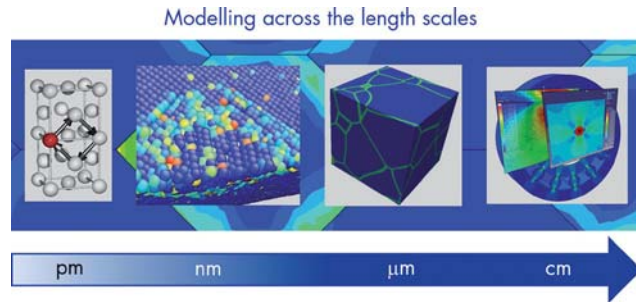


ICAMS  
INTERDISCIPLINARY CENTRE FOR  
ADVANCED MATERIALS SIMULATION

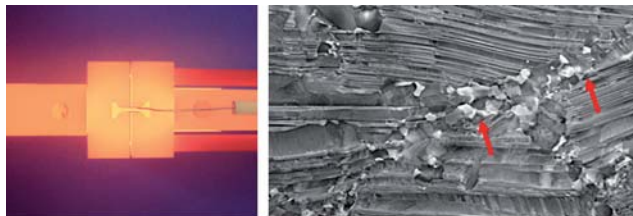
## ICAMS Scientific Challenge: Scale-bridging Modelling and Contributions to the Design of Technical Materials.

ICAMS was founded in 2008 at the Ruhr-Universität Bochum as an interdisciplinary research institute.

ICAMS focuses on the development of methods to predict the behaviour of materials, in order to support the knowledge-based design of new materials with specific properties. This requires a multiscale materials modelling framework that is based on the fundamental laws of nature and links the electronic modelling hierarchy through the atomistic and mesoscale modelling regimes to macroscopic material behaviour.



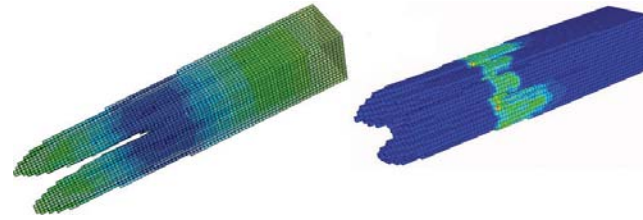
ICAMS is linked through its Advanced Study Groups to the Institute of Materials (Ruhr-Universität Bochum), the Department of Ferrous Metallurgy (RWTH-Aachen), the Max-Planck Institute for Iron Research GmbH in Düsseldorf and the Institute of Materials Physics (WWU-Münster). Through bundling expertise on modelling and simulation of materials across all length and time scales as well as input and insight from industry, ICAMS is in a unique position that will allow it to fast-track the development of advanced multiscale modelling methods.



## Research at ICAMS

Research at ICAMS focuses on alloys and steels, as well as coatings for these materials. The five main project groups comprise the following topics

- Defects and elementary processes,
- Deformation mechanisms and phase transformations,
- Kinetics of phase transitions,
- Thermodynamics and phase stability,
- Transport and response.



## Methods and Competences

The ICAMS departments, together with the Advanced Study Groups, combine a wide expertise in experimental and theoretical materials science that will form the basis for the successful development of frameworks for problem-driven, scale-bridging materials modelling and simulation.

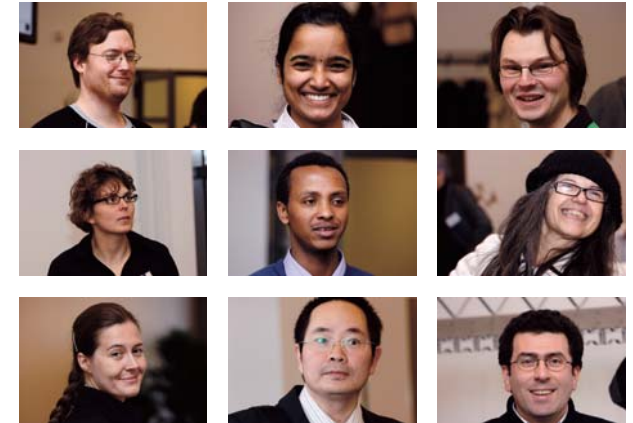
The methods developed and applied at ICAMS range from electronic structure theory over high-throughput atomistic simulations, phase-field modelling, finite-element methods to continuum modelling. These simulation tools are complemented by experimental techniques, like high-resolution electron microscopy, x-ray diffraction, SEM and TEM microscopy, nanoindentation techniques, thermal analysis. Mechanical testing methods, creep and fatigue testing, as well as thermomechanical treatments and arc and vacuum melting allow a state-of-the-art analysis of high-tech materials.

## Interdisciplinary and International

ICAMS brings together researchers from different disciplines across all length scales that are relevant for materials. Most scientists at ICAMS have a degree in the engineering, materials and physical sciences, followed by chemists, mathematicians and computer scientists. This diverse education of ICAMS researchers provides a good basis for the interdisciplinary research of ICAMS.

ICAMS is embedded into a network of national and international collaborations with partners from academia and industry.

People from over 20 countries are currently working at ICAMS and the Advanced Study Groups.



## Teaching

The Ruhr-University Bochum meets the need for material scientists trained in numerical simulation and experimental characterization and processing techniques by the international Master of Science programme "Materials Science and Simulation" (MSS), hosted by the Interdisciplinary Centre for Advanced Materials Simulation.