

Industry advisory board

Steel mills/foundries:

Deutsche Edelstahlwerke GmbH, Siegen
Edelstahlwerke Schmees GmbH, Pirna
ThyssenKrupp Steel Europe AG, Duisburg

Aluminium foundries:

Constellium CRV SAS, Voreppe/France
Metallgießerei an der Mulde GmbH, Freiberg
Nemak Dillingen GmbH, Dillingen

Ceramic filter manufacturers:

Drache Umwelttechnik GmbH, Diez
Foseco Germany Vesuvius GmbH, Borken

Other manufacturers:

Elkem Silicon Materials, Kristiansand/Norwegen
Imerys Aluminates, Paris/France
Refratechnik Steel GmbH, Düsseldorf
Federal-Mogul GmbH, Nuremberg

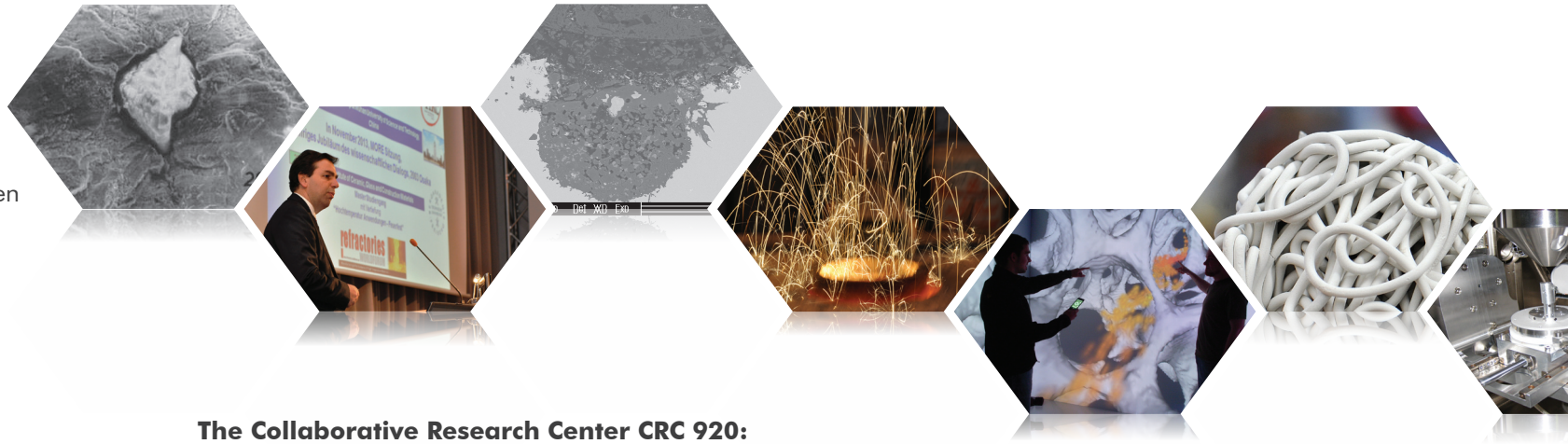
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The Collaborative Research Center CRC 920:

Planned duration: 2011 – 2023
1st program period: 2011 – 2015
2nd program period: 2015 – 2019
3rd program period: 2019 – 2023

Funding: 3.56 million euros/year

DFG advisory:

Dr. Matthias Beilein
Dr. Kathrin Sick
Engineering Science Division



“Smart” ceramic filters for zero-defect,
high-strength safety components

<http://tu-freiberg.de/forschung/sfb920>

AIMS AND VISION

Future high-tech products base upon high purity and zero-defect materials.

As manufacturers call for higher metal qualities and lower defect rates, an even chemical composition and a sufficient **purity level of metallic materials** become critical.

The CRC 920 aims at developing smart filter materials and filter systems for a significantly higher purity of metal melts.

A functionalized filter surface based on **active** ceramic coatings (cold coatings before firing with chemical properties equal to the inclusions) as well as tailored pressure conditions in the porous functional cavities are used to improve the deposition of mineral, non-metallic particles on the filter surface.

In addition, new **reactive** coatings are developed to enhance deposition due to chemical reaction between the functionalized filter surface and gases dissolved in the metal melts. Therefore, a considerable reduction of gas impurities and inclusions below liquidus temperature can be achieved.

The vision of the CRC 920: lighter, zero-defect and reliable materials - for innovations in security and light-weight constructions.

The development of novel filter materials as well as a computer-aided micro- and macrostructure filter design based on investigations of relevant filtration mechanisms will elevate filter efficiency, allowing both thin- and thick-walled high-strength components with superior properties that enhance **passenger safety in cars, trains, and aircrafts**.

PROJECT AREAS

Filter materials
i.e., interfaces,
functionalization,
process parameters

Modeling
i.e., flow
simulation,
model generation

Filter efficiency
i.e., application
tests, mechanical
properties

Novel filter materials with geometrical and material design of the filter structures suitable for the generation of thin- and thick-walled, high-strength metallic components for applications in transportation, electronic and packaging industry

The three project areas inherent to the CRC 920 are intertwined by a continuous exchange of information and results as well as the alignment of workflows and procedures. Thus, an innovative cycle is created, including materials research, materials design, understanding of fundamental effects and mechanisms in active and reactive filter materials up to the generation of demonstrators, the investigation of further metal melts and a transfer of research results into relevant applications.

The three project areas are supplemented by a research training group (MGK), by several service projects (S) and by an internal administration project (Z).

PROJECT SUPPORT

WORKING GROUPS

Research activities in CRC 920 are supported by four interdisciplinary working groups.

- **Working group 1:**
Metal melt/inclusions, active/reactive filter materials, boundary surface design
- **Working group 2:**
Modeling and designing the filter geometry
- **Working group 3:**
Thermo-mechanical characteristics of filter materials and filter structures
- **Working group 4:**
Mechanical characteristics, metallic materials, critical inclusions

SERVICE PROJECTS

Service projects which offer, for instance, 3D and 4D visualization and verification of research results are complementing the scientific work carried out in the project areas.

RESEARCH TRAINING GROUP

The research training group aims at providing structured training programs for doctoral students and working conditions which ensure accelerated graduation and early independence of young researchers. The research training group is committed to the qualification of excellent young professionals ready to start a career in science or industry.

PUBLIC RELATIONS

Current research results and activities of the CRC 920 are presented in the CRC newsletter (published twice a year) and at the CRC's webpage (<http://tu-freiberg.de/forschung/sfb920>).

CRC's image films are available at <http://tu-freiberg.de/forschung/sfb920>.