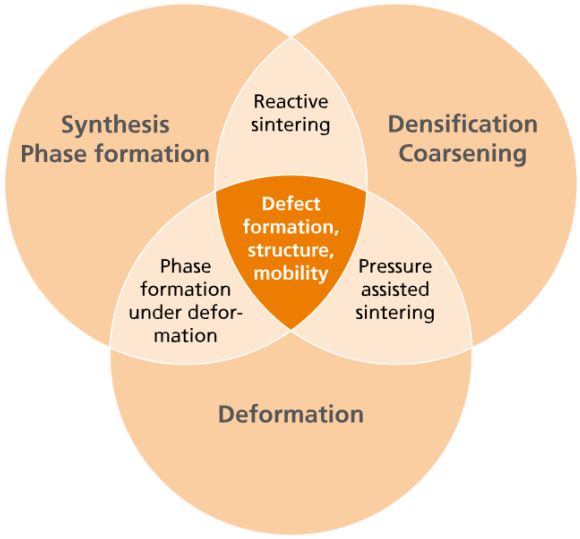
OBJECTIVES

The DFG Priority Programme SPP 1959 is a worldwide unique, coordinated, major research effort, funded for a period of six years. SPP 1959 was started in September 2016 to extend the current level of understanding on how to influence or tailor materials microstructures by the use of external fields. An objective is a unified description of matter transport activated in inorganic solid materials by electric and magnetic fields.



Within SPP 1959, a total of 25 projects (14 in the first and 11 in the second funding period) are providing a fundamental basis built on experimental evidence for understanding how atoms, ions, electrons and defects are affected by external fields, and for intentionally using electromagnetic energy for materials synthesis and processing. Investigations are accompanied by systematical theoretical modelling and computational simulation on different length scales.

COORDINATION

The **Programme Committee** is responsible for the conception and the steering of the Priority Programme:

Roger A. De Souza	RWTH Aachen
Christian Elsässer	Albert-Ludwigs-Universität Freiburg/ Frauenhofer IWM
Olivier Guillon	Forschungszentrum Jülich GmbH / RWTH Aachen
Oliver Gutfleisch	Technische Universität Darmstadt
Sanjay Mathur	Universität zu Köln
Cynthia A. Volkert	Georg-August-Universität Göttingen

The **Coordination Team** is responsible for the implementation of the Priority Programme, as well as the coordination of the participating projects.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DFG Priority Programme SPP 1959

FIELDSMATTER

Manipulation of Matter Controlled by Electric and Magnetic Fields:

Towards Novel Synthesis and Processing Routes of Inorganic Materials

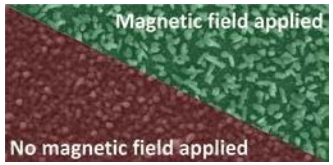
www.fieldsmatter.de

A Priority Programme funded by the
DFG Deutsche Forschungsgemeinschaft

TOPICS

Topic 1: Synthesis and Phase Control

Electric and magnetic field processing are effective tools to control the structural and functional properties of materials. Therefore the impact of magnetic and electric fields and current on defects, phase trans-formation, solid state reactions and micro-structure is investigated in this topic.



Influence of magnetic field on film growth and topography.

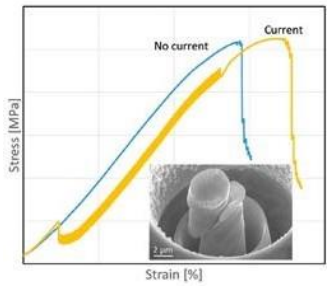
Topic 2: Densification and Coarsening

Technologies, such as electric and magnetic field assisted sintering, offer the possibility to produce materials that are extremely difficult, if not impossible, to obtain by conventional methods. The impact of fields on densification, microstructure and material properties is investigated here.

Field assisted sintering of a high temperature material.

Topic 3: Mechanical Deformation

This topic focuses on the electro- and magneto-plasmatic effects. The use of fields can indeed change the mechanical behaviour. Of solids dramatically and can potentially reduce processing time and temperatures.



Influence of current on mechanical deformation.

PROJECTS

Topic 1: Synthesis and Phase Control

C. Elsässer, C. Tao, M. Hoffmann, J. Preusker, R. A. De Souza: *"Impact of electric fields on microstructure evolution in functional ceramics"*

Albert-Ludwigs-Universität Freiburg
Karlsruher Institut für Technologie (KIT)
RWTH Aachen

C. Elsässer, O. Gutfleisch, F. Maccari, D. Pfalzgraf: *"Processing of magnetic materials enhanced by electric fields or currents"*

Albert-Ludwigs-Universität Freiburg
Technische Universität Darmstadt

M. Martin, N. Ahr: *"Kinetic unmixing and kinetic decomposition of oxides in external electric fields"*

RWTH Aachen

S. Mathur, R. Weißing, Z. Aytuna, D. Müller, B. May: *"Magnetic Field-assisted Chemical Vapor Deposition of Transition Metal Oxides and in situ Investigations on Electronic Structure by X-ray"*

Universität zu Köln
Forschungszentrum Jülich GmbH

A. Voigt, R. Backofen: *"The Influence of Electric and Magnetic Fields on Microstructure in Multiferroic Composite Materials - a Phase-Field-Crystal Approach"*

Technische Universität Dresden

Topic 2: Densification and Coarsening

R. A. De Souza, S. Körfer, A. Usler, O. Guillon, A. Dash: *"Diffusion-controlled processes in polycrystalline ceria: Combined effect of electrical field and mechanical loading"*

RWTH Aachen
Forschungszentrum Jülich GmbH

R. Kirchheim, C. A. Volkert, T. Brede: *"The impact of high current densities and magnetic fields on the microstructure of nanocrystalline iron- and nickel-based alloys and related effects during spark plasma sintering of these alloys"*

Georg-August-Universität Göttingen

D. Lupascu, D. Lewin: *„Flash sintering of Perovskites"*

Universität Duisburg-Essen

C. A. Volkert, D. Schwarzbach: *"In-Situ Electron Microscopy Studies of Flash Annealing in Oxide Ceramics"*

Georg-August-Universität Göttingen

C. Broeckmann, Y. Deng, S. Wang, M. Bram, T. Mishra: *„From FAST to FLASH: Field Assisted Sintering of oxide ceramics with controlled electric field and current density"*

RWTH Aachen
Forschungszentrum Jülich GmbH

Topic 3: Mechanical Deformation

G. Gerstein, E. Karsten, S. Zaefferer, A. Tripathi, S. Nandy: *„Micromechanisms of the electro-plastic effect in magnesium alloys investigated by means of electron microscopy"*

Gottfried Wilhelm Leibniz Universität Hannover,
Max-Planck-Institut für Eisenforschung GmbH