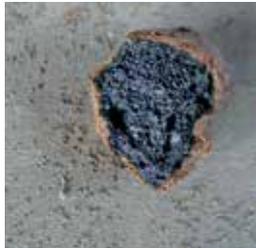
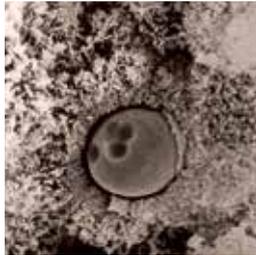


# AdMaS<sup>®</sup>

ADVANCED MATERIALS, STRUCTURES  
AND TECHNOLOGIES

BRNO FACULTY OF CIVIL  
UNIVERSITY ENGINEERING  
OF TECHNOLOGY



# AdMaS<sup>®</sup>

**ADVANCED MATERIALS, STRUCTURES  
AND TECHNOLOGIES**

## AdMaS centre

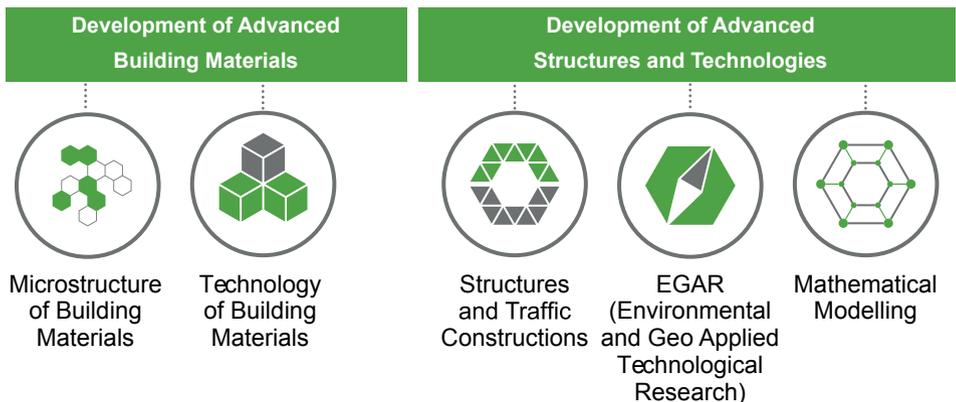
(Advanced Materials, Structures and Technologies)

is modern science centre and complex civil engineering research institution affiliated to the Faculty of Civil Engineering, Brno University of Technology.

The centre focuses on research, development and application of advanced building materials, structures and technologies in civil engineering, and also transport systems and infrastructures of cities and municipalities. We also provide for the needs of building investors comprehensive feasibility studies and assessment of the economic efficiency of construction investments.

Faculty of Civil Engineering is an expert institute registered in the list of expert institutes kept by the Ministry of Justice of the Czech Republic and it covers the expert activities in the branch „Construction“ as well as „Geodesy and cartography“. Therefore the AdMaS Centre is entitled to issue the expert opinions in accordance with the law.

## Structure of the centre



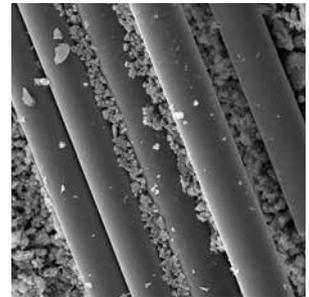
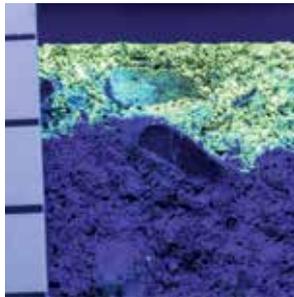
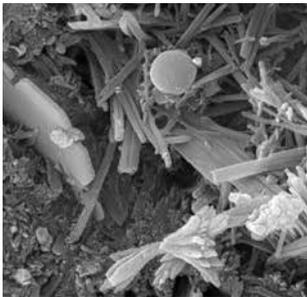
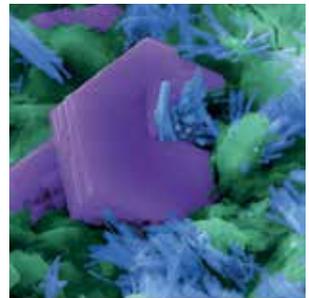
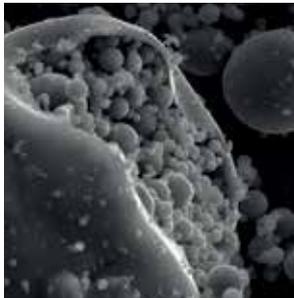
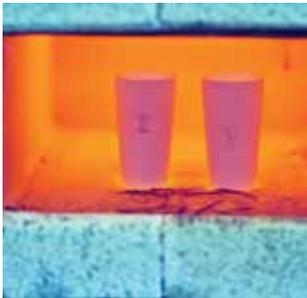


# Microstructure of Building Materials

The main professional orientation of the research group is the study and evaluation of the structure and microstructure of materials and raw materials with the aim to determine substantial properties necessary for their optimum application in building materials. An integral part of complex testing of materials is also monitoring and exploration of the causes of the degradation process in building materials and the creation of procedures for improving their durability. The latest destructive and non-destructive test methods are used for studying the structure and micro-structure of materials with simultaneously developing new methods and procedures for verifying the properties of materials.

## The modern instrumentation of the research group allows:

- complex evaluation of the properties of building materials,
- analyses of the microstructure of materials including determination of the phase composition of examined materials and determination of the contents of subcomponents,
- 3D visualization of the micro- and macrostructure of examined materials,
- analyses of the behaviour of materials at different temperatures up to 1600 °C,
- detection and localization of faults and defects of materials, monitoring of the development of their deformation, development of cracks and corrosion,
- simulation of the action of aggressive effects to verify the durability of building materials,
- evaluation of the environmental impact of selected materials,
- modelling and simulation of the properties of materials based on the knowledge obtained by experimental testing,
- complex material and technological solutions for restoration of existing constructions.





# Technology of Building Materials

The main professional orientation of the research group is development and re-research of new building materials and advanced production technologies including optimization of existing production processes. The research and development of this field is aimed at the development of advanced materials with higher utility parameters and durability with main orientation on sulphurous, silicate and cement-free binders, modern concrete technologies, ceramic, polymeric and insulating materials.

## The special instrumentation of the research group allows:

- testing of self compacting, high performance, ultra-high-strength, sprayed and higher fire resistant concretes,
- determination of volume changes in materials in different temperatures and humidity conditions,
- determination of the physical and chemical characteristics of building materials,
- complex testing of the rheological properties of fresh composites,
- testing of thermally insulating, acoustic, diffusion and other physical properties,
- proposals for the optimum utilization of secondary and renewable raw materials as a substitution for primary raw materials, development of new building materials,
- simulation of climatic effects on building materials, forecasting of their life span,
- monitoring of the effects of different temperature loads and their cycling on the durability of building materials,
- simulation of the behaviour and durability of building materials and components in chemically aggressive environments of all states,
- complex testing engineering of concretes, binders, aggregates, plasters and ceramic products in an accredited testing laboratory,
- diagnostics and assessments (building-technical surveys, expertises) of building materials in constructions.
- experiments in test furnaces and devices for extreme stress of building materials, components and structures (determining the reaction to fire, setting fire resistance).





## Structures and Traffic Constructions

The main activities of the Constructions and Transport Structures research group are focused on the research and development in the field of load-bearing building structures and transport structures. The research and development concentrates on new structural and material designs of structural elements and components of load-bearing building structures, as well as modern constructions of transport structures. Emphasis is placed on advanced building structures and technologies in terms of their improved reliability, durability and economy during the entire life cycle, with regard to mutual relation and connection of monitored and solved problems. An integral part is also experimental verification of load-bearing structures and systems, as well as the application of modern simulation methods.

- complex structural-technical, material and static survey of wooden, masonry, concrete and steel structures, full-scale testing,
- analyses, reconstruction designs, rehabilitation and revitalisation of all types of building structures including bridges,
- experimental verification of the actual action and load capacity of ferroconcrete structural elements made of advanced materials,
- analyses and long-term evaluation of pavement surfaces and structures, pavement diagnostics, research and development of new materials and full-scale testing of pavement structures,
- determination of traffic flow characteristics, transport and pedestrian modelling, design of safety improvements of roads, modelling of fire spread and fire safety of building and transport structures,
- modern and effective railway constructions and the environment,
- testing of construction elements, details and models during extreme mechanical and thermal stress, including dynamic and fatigue testing,
- study of construction and physical processes of sloping green roofs, advanced thermal insulation of wooden buildings and energy self-sufficient buildings.





# EGAR

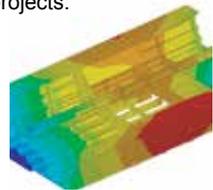
Applied research in the fields of Environmental Technology, Geotechnics and Geodesy is the main focus of the EGAR research group - Environmental and Geotechnics and Geodesy Applied Technological Research.

EGAR research group implements research activities and provides co research in the following areas:

- **Urban Engineering** - wastewater treatment technology; drinking water treatment; waste management; concept, measurement, diagnosis and evaluation of technical condition of infrastructure; drinking water and wastewater chemistry; solving interdisciplinary linkage of buildings, infrastructure and region,
- **Energy Diagnostics of Buildings and Regions „Smart Cities and Regions“** - optimization and streamlining of energy flow in regions, local areas, buildings; planning and management of buildings with nearly zero energy consumption; energetic management of territorial units,
- **Geotechnics** - geo-mechanical characteristics and their mechanical behavior in interaction with geotechnical structures; research in the field of exploitation of geothermal energy from geological environment,
- **Geoinformatics** - survey of actual status of land, actual design of buildings, including 2D and 3D documentation; processing and digitization of maps, GIS applications included; objects and technological units passportization; creation of 3D models using both stationary and mobile terrestrial and airborne laser scanners.

Main professional orientation of the research group:

- testing and development of new waste water and drinking water treatment technologies,
- energy, ecological and sustainable conception of development of urban settlements and regions,
- development and verification of methodologies for testing of the practical applications of field and laboratory measurements, evaluations (including mathematical modelling) and development of methodologies in the field of geotechnical methods of survey and diagnostics of the foundation conditions of structures,
- geodetic, photogrammetric and metrological support for building activities and research,
- development and verification of methodologies for measuring the thermal and microclimatic properties of buildings and parts of structures,
- research of methodologies for economic analyses of macroeconomic projects.





# Mathematical Modelling

The group deals with research, development and practical applications of complex methods for examination of response of building structures and structural elements in relation to their reliability and durability.

## Offer of the Mathematical Modelling research group:

### ■ Analyses of load-bearing structural systems:

- Support for experimental verification of the properties of building structures by using modern simulation methods allowing a significant reduction of the necessary number of simulations,
- Theoretical verification of the properties of building structures with help of analytical or numerical solutions using the finite element method and other methods.

### ■ Support for designing constructions using interdisciplinary procedures:

- Simulation methods,
- Optimization of structural design by deterministic and stochastic approaches.

### ■ Carrying out calculations and simulations:

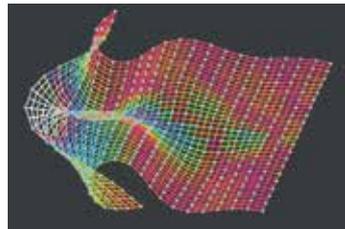
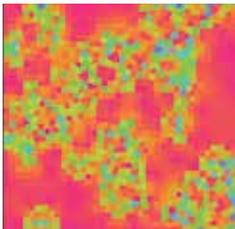
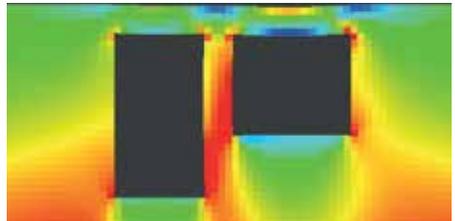
- Mathematical modelling of structural details, elements and components,
- Simulations of structural stresses using experimental data,
- Simulations of extreme stress of structural elements,
- Statistical simulations and evaluations,
- Modelling of selected technological processes,
- Processing of data from „In situ“ measurements.

### ■ Development and verification of new methodologies:

- For verification of practical applications in terms of durability analyses,
- Improvement and application of the integral method for complex analyses of cement composite elements.

### ■ Extra-dimensional 3D printing, scanning and advanced modeling:

- rapid formation of extra large functional prototypes up to 690x690x1900 mm with an optical scanner and the largest FDM printer available on the market.



# AdMaS<sup>®</sup>

ADVANCED MATERIALS, STRUCTURES  
AND TECHNOLOGIES

## AdMaS centre

Brno University of Technology

Faculty of Civil Engineering

**Purkyňova 651/139**

**612 00 Brno**

**Czech Republic**

- [www.admas.eu](http://www.admas.eu)
- [admas@fce.vutbr.cz](mailto:admas@fce.vutbr.cz)
- phone no.: +420 541 148 011
- GPS 49°14'07.5"N 16°34'19.4"E

