

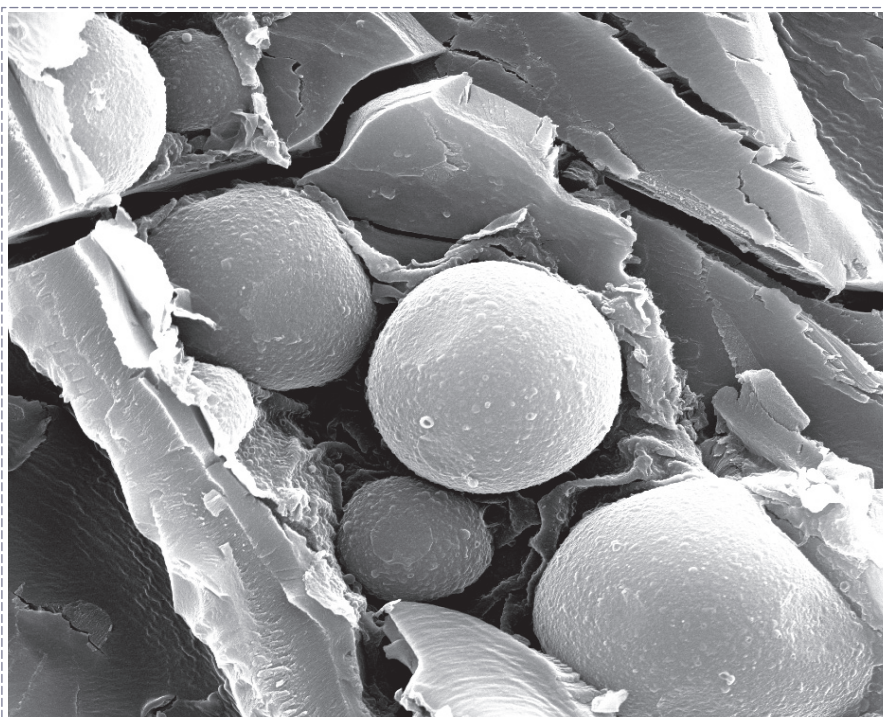
DEPARTMENT OF GEOCHEMISTRY



INSTITUTE OF ROCK STRUCTURE AND MECHANICS
of the Czech Academy of Sciences

THEMATIC RESEARCH FOCUS

- COAL AND ORGANIC PETROLOGY
- MINERALOGY AND PETROGRAPHY OF MAGMATIC ROCKS
- ORGANIC AND INORGANIC CHEMISTRY OF GEOMATERIALS
- SORPTION AND POROSIMETRIC ANALYSES



SEM photomicrograph of corphuminite and resinite bodies in cells of coalified wood tissue from the trunk in the Bilina Mine of the Most Basin

JOIN RESEARCH CENTER

The joint Laboratory of Sorption and Porosimetric Analysis was established between the Institute of Rock Structure and Mechanics and the Faculty of Science, Charles University. Joint research is focused on the porous texture of rock materials and their changes due to environmental conditions and technological processes.

MAIN RESEARCH SUBJECTS

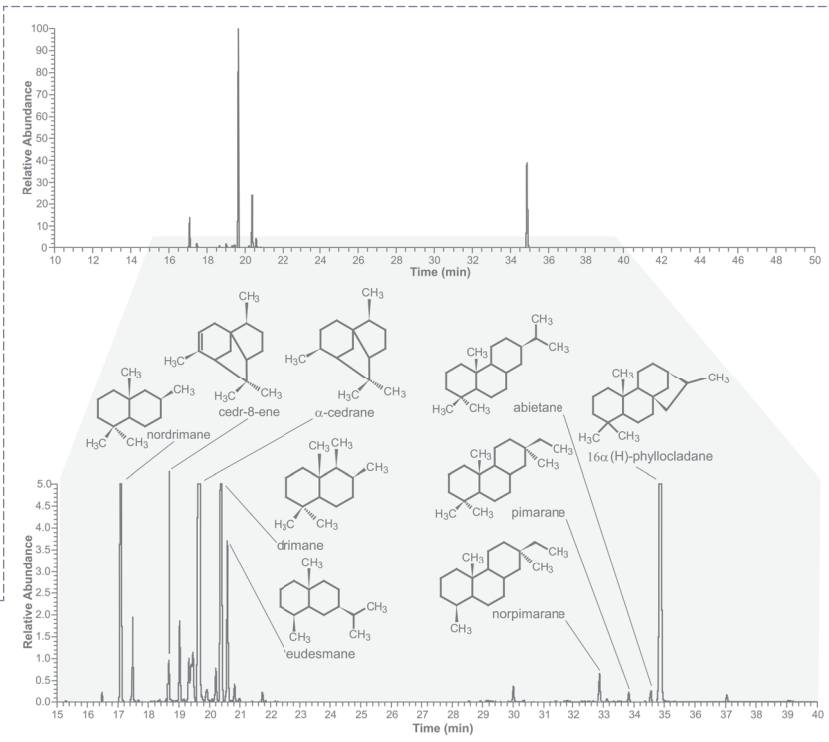
- Studies of paleoenvironmental and palaeoclimatic conditions, and the weathering processes of sedimentary basins
- Coalification and dispersed organic matter in relation to diagenesis and metamorphism of rocks
- Investigation of the properties of the corrosion layer on cladding pipes of nuclear fuel material
- Products of incomplete combustion, carbonaceous particles and hydrocarbons in environmental samples and sediments
- Mineralogy and geochemistry of selected accessory minerals and studies of their phase stabilities under magmatic and postmagmatic conditions
- Petrology and geochemistry of granite suites of the Bohemian Massif
- Detection of modifications of rock fabric by conservation agents used for hydrophobisation and consolidation of stones
- Investigation into the carbon dioxide and methane sorption capacities of coals and shales, depending on their properties

KEY RESEARCH EQUIPMENTS

- Axio Imager 2 Research Microscope
- NIKON stereoscopic microscope
- NIKON microscope with LUCIA image analysis system, Laboratory Imaging
- Olympus BX51 microscope with a QDI spectrophotometer system, CRAIG Technologies
- Olympus BX51 microscope for transmitted light with fluorescence mode and polarized light
- DuraScan-20 microhardness tester, Struer Gas chromatograph mass spectrometer
- ThermoElectron Trace-DSQ II
- CDS 5000 Pyroprobe Unit
- Pascal 140+240 Porotec POROSIMETER
- SORPTOMATIC 1990, Thermo Scientific
- IGA 002 Intelligent Gravimetric Analyser
- Hiden – gas and vapour sorption
- High pressure sorption apparatus, up to 15 MPa (original design and construction)
- Quantachrom pycnometer

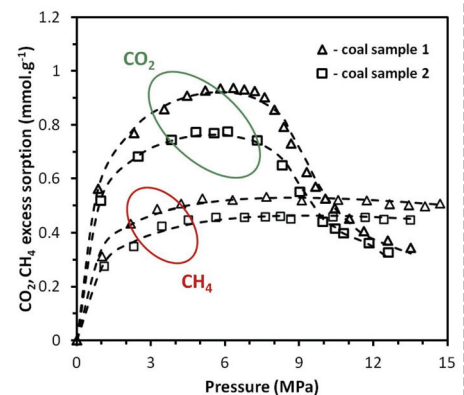


Olympus BX51 microscope with QDI spectrophotometer system, Craig Technologies, in fluorescent mode



Total ion chromatogram of the aliphatic fraction of a fossil wood sample extract from the Miocene "Stump Horizon" in the Bilina open pit mine of the Most Basin

High pressure manometric sorption apparatus

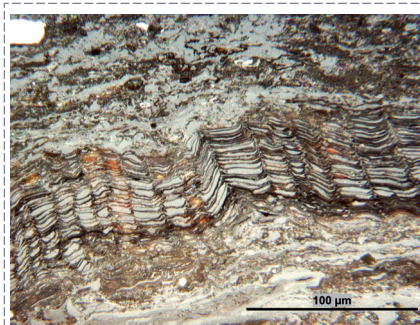


High pressure sorption isotherms of carbon dioxide and methane on coal samples at 45 °C

ACHIEVEMENTS (LAST 5 YEARS)

● Petrology and organic geochemistry of mires and sediments

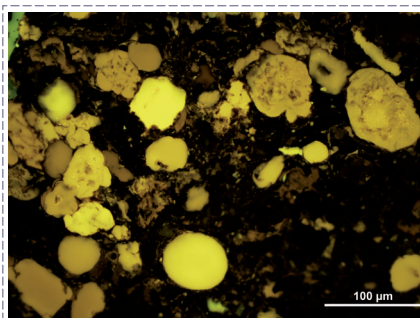
V. Suchý, I. Sýkorová, M. Havelcová, V. Machovič, A. Zeman, H. Trejtnarová, 2013. *Cementation and blackening of Holocene sands by peat-derived humates: a case study from the Great Dune of Pilat, Landes des Gascogne, Southwestern France*. *International Journal of Coal Geology* 114, 19–32.



Texture of bark tissue in lignite from the Žittau Basin

M. Havelcová, I. Sýkorová, A. Bechtel, K. Mach, H. Trejtnarová, M. Žaloudková, P. Matysová, J. Blažek, J. Boudová, J. Sakala, 2013. "Stump Horizon" in the Bílina Mine (Most Basin, Czech Republic) – GC-MS optical and electron microscopy in identification of wood biological origin. *International Journal of Coal Geology* 107, 62–77.

M. Havelcová, I. Sýkorová, H. Trejtnarová, A. Šulc, 2012. *Identification of organic matter in lignite samples from basins in the Czech Republic: Geochemical and petrographic properties in relation to lithotype*. *Fuel* 99, 129–142.

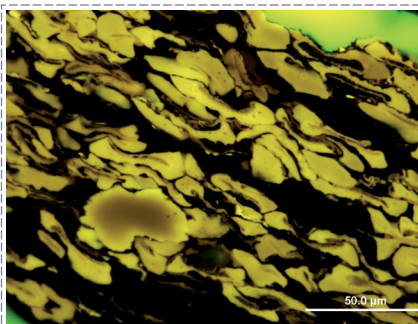


Mixture of resinite bodies in the detrital matrix of the liptobiolite from the Sokolov Basin, fluorescent mode

● Natural sorbents for removal of toxic elements from waste waters

M. Havelcová, J. Mizera, V. Machovič, L. Borecká, O. Příbyl, I. Krausová, 2013. *Sorption of heavy metals on lignite impregnated with chitosan*. *Acta Geodyn. Geomater.* 10, 105–110.

M. Havelcová, J. Mizera, I. Sýkorová, M. Pekař, 2009. *Sorption of metal ions on lignite and the derived humic substances*. *Journal of Hazardous Materials* 161, 559–564.



Yellow fluorescent sporinite in bituminous coal

● Contamination by carbonaceous particles of anthropogenic origin

M. Havelcová, A. Melegy, S. Rapant, 2014. *Geochemical distribution of polycyclic aromatic hydrocarbons in soils and sediments of El-Tabbin, Egypt*. *Chemosphere* 95, 63–74.

J. Sysalová, I. Sýkorová, M. Havelcová, J. Száková, H. Trejtnarová, B. Kotlík, 2012. *Toxicologically important trace elements and organic compounds investigated in size-fractionated urban particulate matter collected near the Prague highway*. *Science of the Total Environment* 437, 127–136.

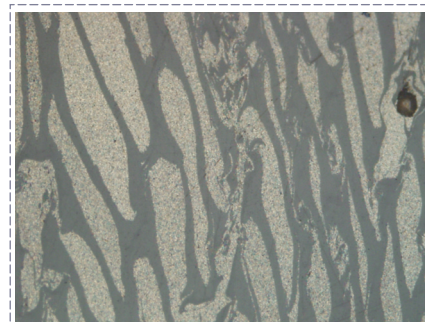
I. Sýkorová, M. Havelcová, A. Zeman, H. Trejtnarová, 2011. *Carbon air pollution reflected in deposits on chosen building materials of Prague Castle*. *Science of the Total Environment* 409, 4606–4611.

● Effect of porous structure on technological process

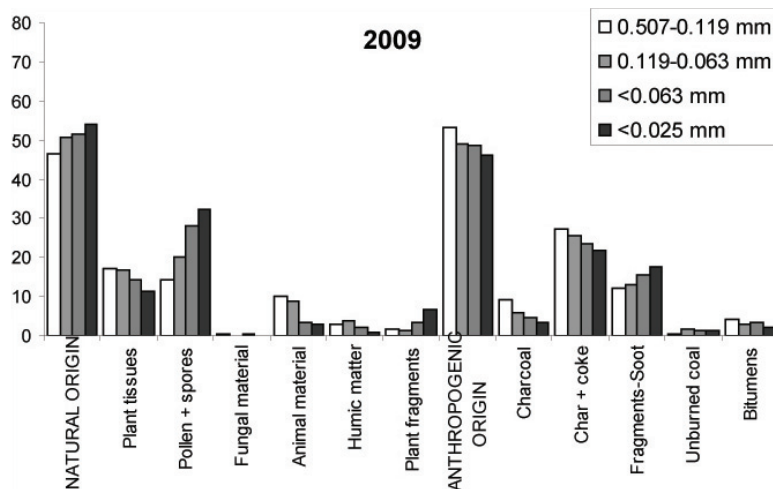
R. Příkryl, Z. Weishauptová, 2010. *Hierarchical porosity of bentonite-based buffer and its modification due to increased temperature and hydration*. *Applied Clay Science* 47, 163–170.

J. Medek, Z. Weishauptová, 2009. *Gel structure of the corrosion layer on cladding pipes of nuclear fuel*. *Journal of Nuclear Materials* 393, 306–310.

R. Příkryl, Z. Weishauptová, M. Novotná, J. Příkrylová, A. Štátná, 2011. *Physical and mechanical properties of the repaired sandstone ashlar in the facing masonry of the Charles Bridge in Prague (Czech Republic) and an analytical study for the causes of its rapid decay*. *Environmental Earth Sciences* 63, 1623–1639.



Telinite and macrinite in bituminous coal from the Czech part of the Upper Silesian Basin



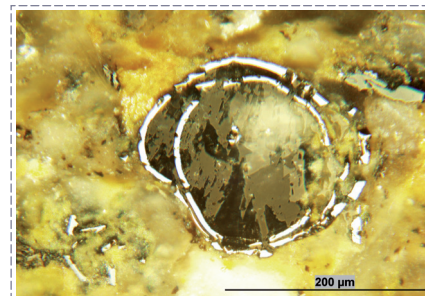
Composition and morphology of carbonaceous particles in particulate matter fractions, separated at Congress centrum in Prague, in 2009

● Effect of coal properties on CO₂ sorption

Z. Weishauptová, I. Sýkorová, 2011. *Dependence of carbon dioxide sorption on the petrographic composition of bituminous coals from the Czech part of the Upper Silesian Basin, Czech Republic*. *Fuel* 90, 312–323.

M. Švábová, Z. Weishauptová, O. Příbyl, 2011. *Water vapour adsorption on coal*. *Fuel* 90, 1892–1899.

M. Švábová, Z. Weishauptová, O. Příbyl, 2012. *The effect of moisture on sorption process of CO₂ on coal*. *Fuel* 92, 187–196.

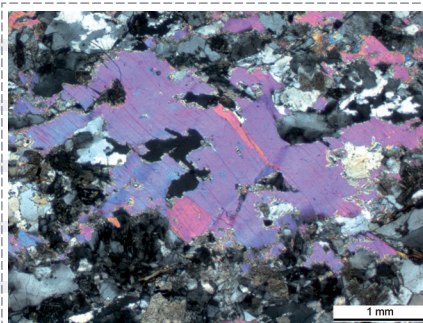


Fusinite with carbonate filling in lacustrine claystone from the Central Bohemian Basin

● **Petrology and geochemistry of granite suites of the Bohemian Massif**

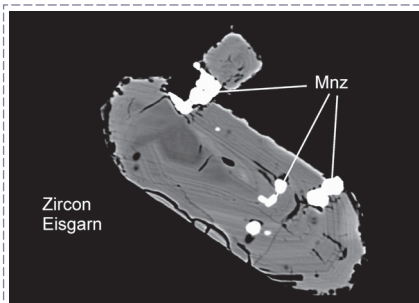
M. René. 2012. Petrology, geochemistry and origin of topaz granite. In: Blasik M., Hanika B. (eds.) *Granite, occurrence, mineralogy and origin*. Nova Science Publishers, Inc., New York, 99-115.

F. Parat, F. Holtz, M. René, R. Almeev, 2010. *Experimental constraints on ultrapotassic magmatism from the Bohemian Massif (durbachite series, Czech Republic)*. – Contributions to Mineralogy and Petrology 159, 331-347.



Microphotography of partly deformed muscovite crystals from two-mica granites of the Moldanubian batholith

● **Mineralogy and geochemistry of selected accessory minerals and studies of their phase stabilities under magmatic and postmagmatic conditions**



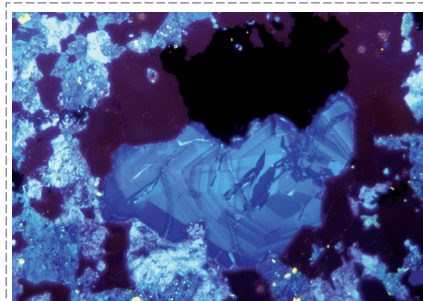
SEM BSE image showing zoned zircon with monazite inclusions (Mnz) from two-mica granite of the Moldanubian batholith

M. René, 2013. *Composition of coexisting zircon and xenotime in rare-metal granites from the Krušné Hory/Erzgebirge Mts., Central Europe*. Mineralogy and Petrology, DOI 10.1007/s00710-013-0318-y.

M. René, 2012. *Occurrence of Th, U, Zr and REE-bearing accessory minerals in granites and their petrogenetic significance*. In: Blasik M., Hanika B. (eds.) *Granite, occurrence, mineralogy and origin*. Nova Science Publishers, Inc., New York, 27–56.

● **Sn-W and U mineralization connected with granite suites**

Z. Dolníček, M. René, S. Hermannová, W. Prochaska, 2014. *Origin of the Okrouhlá Radouň episyenite-hosted uranium deposit, Bohemian Massif, Czech Republic: fluid inclusion and stable isotope constraints*. Mineralium Deposita 49, 409-425.

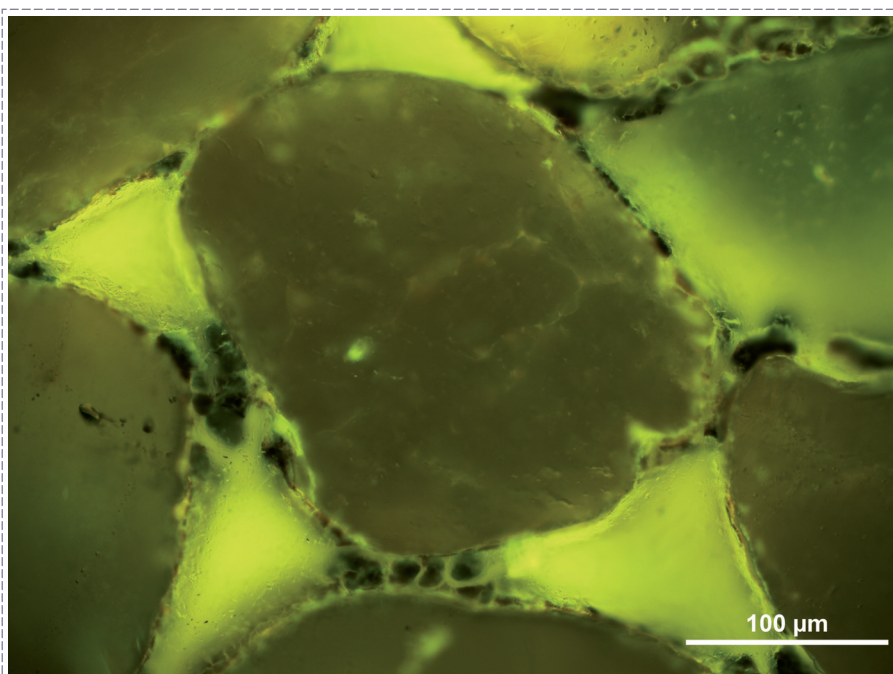


Cathodoluminescence (CL) micrograph of zoned topaz from topaz granite, Hub stock, Horní Slavkov

M. Machek, Z. Roxerová, V. Janoušek, M. Staněk, E. Petrovský, M. René, 2013. *Petrophysical and geochemical constraints on alteration processes in granites*. Studia geophysica et geodaetica 57, 710-740.

MAIN COLLABORATING PARTNERS

- Charles University (Praha, CZ)
- Brno University of Technology (Brno, CZ)
- Masaryk University (Brno, CZ)
- Technical University – VŠB (Ostrava, CZ)
- Palacký University (Olomouc, CZ)
- Nuclear Physic Institute ASCR, v.v.i. (Řež, CZ)
- Institute of Chemical Technology (Praha, CZ)
- Institute of Theoretical and Applied Mechanics ASCR, v.v.i. (Praha, CZ)
- Geological Institute ASCR, v.v.i. (Praha, CZ)
- Czech Geological Survey (Praha, CZ)
- National Research Centre (Cairo, Egypt)
- North Bohemia Coal Mines (Severočeské doly a.s.) (Bílina, CZ)
- UJP Praha a.s. (Praha, CZ)
- Sokolovská uhelná a.s.
- Leibniz University (Hannover, Germany)
- University of Salzburg (Salzburg, Austria)



Quartz grains cemented by nonfluorescent humic substance in sandstone collected on the beach of the Great Dune of Pilat, Arcachon Bay, France. Texture of bark tissue in lignite from the Zittau Basin



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