

THE CENTRE FOR TEXTURE ANALYSIS (CTA)



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

CENTRE IS INVOLVED

- IN THE CHARACTERIZATION OF THE STRUCTURAL TEXTURE AND PROPERTIES OF ROCKS AND DERIVED MATERIALS THROUGH SURFACE CHEMISTRY AND PETROLOGY
- IN THE NEW INTERPRETATION OF TEXTURES AND PROPERTIES OF DIFFERENT KINDS OF MATERIALS IN CONJUNCTION WITH THEIR FORMATION AND BEHAVIOUR
- IN THE UNDERSTANDING MATERIAL PROPERTIES AND BEHAVIOUR DURING NATURAL, ANTHROPOGENIC OR TECHNICAL PROCESSES

CENTRE CONSISTS OF THREE RELATED PARTS

LABORATORY FOR SAMPLE PREPARATION AND BASIC CHARACTERISATION OF SAMPLES

The laboratories provide general procedures for exclusion of material, sample homogenization, subsampling and obtaining a constant weight of a sample. Sample testing includes basic analytical methods as moisture, ash, volatile matter, and calorific value determination, and elemental composition to ensure compliance with international standards.

LABORATORY FOR OPTICAL MICROSCOPY

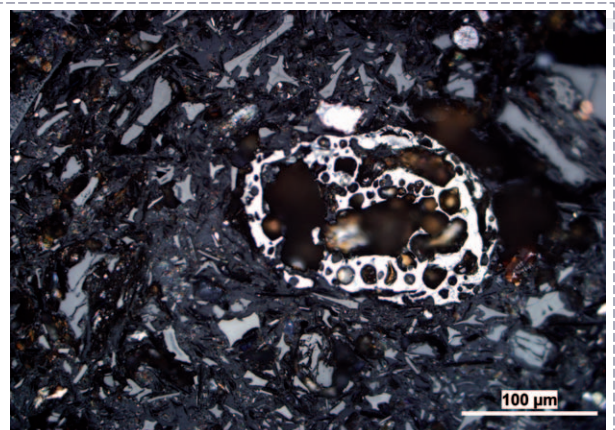
The laboratory provides fundamental organic petrographic (microscopic) characteristics which are applied to various geoscience investigations as fossil fuel exploration, coal utilization, environmental pollution, studies of anthropogenic impact, coal fires, archaeological and forensic aspects, and other multidisciplinary applications.

The lab is equipped with a modernized incident **light microscope BX51 Olympus with microphotometer and fluorescence** mode to:

- evaluate random reflectance in normal light, maximal and minimal reflectance in polarized light and fluorescence intensity to assessment of rank/maturation stage, alteration and weathering degree of organic matter;
- identify, quantify and characterize organic components in terms of macerals, maceral groups of vitrinite/huminite, liptinite, inertinite, faunal relics, microfossils, bitumens;
- apply for un-conventional petrographic studies of distribution, inter-growth, porosity types (pores, degassing pores, cracks and shape of cracks), optical isotropic/anisotropic textures, internal reflections and changes in reflectance and fluorescence colour and intensity of original (unaltered), altered and newly formed organic matter from ore deposits, coal fires and self-heating in mines and coal waste piles, and others natural and industrial thermal processes.



BX51 Olympus light microscope with photometer and fluorescence



Cross-section of highly reflective spherical particle with porous walls in dark mass of bitumen with scattered fragments of coke and with minerals: products of coal pyrolysis from surface of burned-out coal waste heap (Žacléř).

LABORATORY FOR SORPTION ANALYSIS

On the basis of sorption processes the laboratory provides a detailed study of the textural properties of porous materials with a significant relationship to natural and anthropogenic processes. The isotherms dealing with the physical adsorption of gases and vapors provide the most important characteristics of the sorbents which include, among other things, pore volume, pore size distribution and surface area. The isotherms provide information about the adsorption mechanism strictly connected with interactions between adsorbent and adsorbate molecules.

The laboratory was equipped with the following new equipment used for sorption analysis and testing of samples:

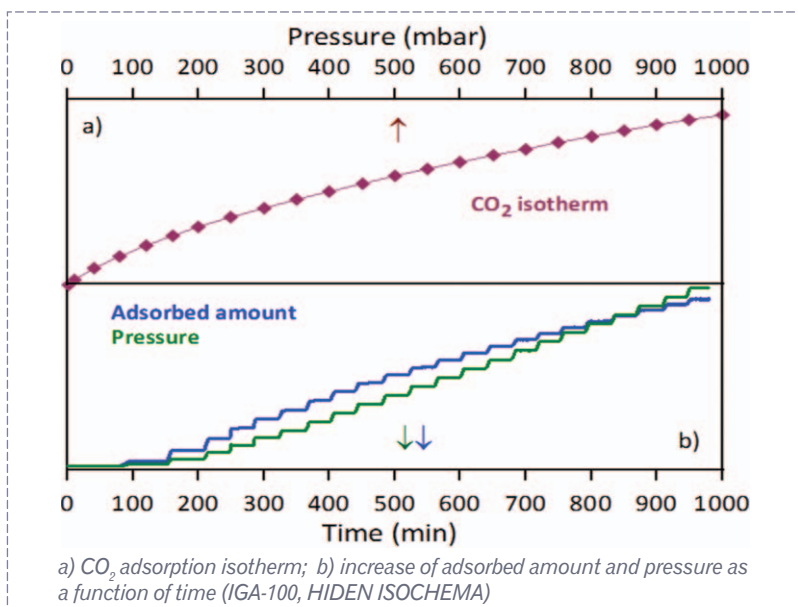
- **IGA-100 Gravimetric sorption analyzer, Hiden Isochema**, which is typically used in the study of moisture sorption, organic vapor sorption, pore size distribution determination, vapor diffusion coefficient determination, mixed gas sorption, kinetics study, temperature-programmed desorption (TPD), thermal decomposition, evolved gas analysis (EGA), and thermogravimetric analysis (TGA). The apparatus allows for conducting experiments in static or dynamic mode and is coupled with a mass spectrometer. It can be used to study the sorption of a wide range of gases and vapors, including: simple gases (e.g. H_2 , CO_2 , CH_4 , O_2 , N_2 , Ar), water, alcohols, aromatics, chlorinated compounds and hydrocarbons. Operation pressure is up to 2 MPa in a temperature range from $-196\text{ }^\circ\text{C}$ to $1000\text{ }^\circ\text{C}$.
- **Thermo Fisher Scientific SURFER – volumetric analyzer**, which allows for the measurement of isotherms of different gases (e.g. N_2 or Ar and Kr) and the determination of specific surface area, ultra micro, micro and mesopore size distribution and total pore volume. The characterization of pore size distribution can be calculated according to various models (e.g. BJH, NLDFT). The BET low temperature nitrogen method is applied as the standard procedure for determining the surface area of powders and porous materials.



IGA-100 Gravimetric sorption analyzer, Hiden Isochema



Thermo Fisher Scientific SURFER – volumetric analyzer



- CENTRE, AS A PART OF DEPARTMENT OF GEOCHEMISTRY, WAS CREATED IN THE YEAR 2015 AND WAS FINANCED FROM EU STRUCTURAL FUNDS IN OPERATIONAL PROGRAMME PRAGUE – COMPETITIVENESS, 8% FINANCIAL SUPPORT CAME FROM PRAGUE CITY HALL, AND A PART WAS FUNDED BY INSTITUTE ALONE.
- CENTRE WAS ESTABLISHED BY RECONSTRUCTION OF OLD LABORATORIES AND EQUIPPED WITH MODERN INSTRUMENTATION.



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