

Organic Geochemistry Laboratory

Organic geochemistry has been an important field of research in the institute since ~1970. At the beginning the major scope was gaschromatography (GC) and MSSV (micro scale sealed vessel) pyrolysis GC study of crude oil, source rocks and organic-rich sediments. Analytical background was supplemented by a high precision furnace for thermal treatment experiments. The investigation of organic matter of thermal waters started in the late '90-ies. To establish an experimental background, a hydrous pyrolysis (aquathermolysis) reactor vessel (Parr Instruments) was purchased in 2005, and two additional reactors in 2010 equipped with a computer for data acquisition.

Thanks to a scientific innovation programme of the Hungarian Academy of Sciences, a GC/TOFMS was obtained in 2012 (with a CDS5150 pyrolyser unit) and an accelerated solvent extractor (ASE350) in 2013. The MSSV system was also updated (Hall Analytical Laboratories).

Recent fields of research:

- dissolved aromatic compounds of thermal waters, experimental modelling of their generation and transformation;
- distribution of regular acyclic isoprenoid alkanes in crude oil and experimental study of their generation and cracking;
- soil lipids and impact of different extraction methods on the lipid fraction;
- thermal stability of crude oils, reaction kinetic parameters of oil to gas cracking;
- paleoclimatological study of fine-laminated sediments.

The Organic Geochemistry Laboratory cooperates with Stable Isotope Laboratory in many topics.

Running projects

Acyclic regular isoprenoid hydrocarbons: their formation, stability and application as organic facial and maturity parameter (OTKA K84086, Csanád Sajgó)

Organic matter – water isotope exchange in meteorites (cooperation with Institut de Planétologie et d'Astrophysique de Grenoble)

Instruments

Sample preparation

ASE350 (Automated Solvent Extractor 350, Thermo Scientific)

Automated extractor for solid samples, Its advantage is speed, good reproducibility and solvent saving operation.



Thermo Scientific ASE350

MSSV pyrolysis (Kalória Kft., Hall Analytical Laboratories)

During micro scaled sealed vessel pyrolysis sample is put in a ~40microl capillary and flame sealed. Thermal treatment is carried out in two high precision furnaces.

Hydrous pyrolysis (aquathermolysis) reactor vessels (Parr Instruments)

Parameters of the three, programmable, stainless steel reactors are the following:

Parr (4760): 600ml, max. temperature: 330°C, max. pressure: 144 bar

Parr (4625): 600ml, max. temperature: 350°C, max. pressure: 245 bar

Parr (4740): 75ml, max. temperature: 370°C, max. pressure: 410 bar

Temperature and pressure values can be detected and stored on a computer. Headspace and fluid sampling are available.



Parr Instruments, 4760 General Purpose Vessel

Analytical instruments

Pyrolysis Gaschromatography (py-GC)

A Fisons 8360 and a Dani GC are used, equipped with FID. The latter is capable of quantitative analysis using butane as reference gas. Liquid injection and successive thermal desorption and pyrolysis GC analysis of MSSV samples can be performed on both instruments.

Gaschromatography-mass spectrometry (GC-MS)

The Dani Master TOF (Time-of-Flight) MS is equipped with a CDS 5150 pyrolyser unit, PVT injector and autosampler.



DANI Master GC/TOF

Staff

József Fekete, PhD, geologist, research fellow, *group leader*

Csanád Sajgó, CSc, chemical engineer, senior research fellow, retired

Eleonóra Bánki-Mészáros, chemist

Eszter Nagy, chemical engineer

Katalin Kovács-Varga, technician