LABORATORY: Stone LAB

NAME OF THE INSTRUMENT

High Resolution-Accurate Mass GC-MS and Pyrolysis/ High Resolution-Accurate Mass GC-MS

GENERAL INFORMATION:

Gas chromatograph coupled to a High Resolution-Accurate Mass mass spectrometer (GC-HRA-MS) with Orbitrap technology useful for the analysis of organic materials (e.g. glycerolipids, natural waxes, protein, resinous and polysaccharide material). The combination of the pyrolyzer with GC-MS allows characterizing macromolecules (e.g. natural and synthetic resins) through the recognition of the products obtained from pyrolysis.

The GC-MS analysis involves a different sample preparation (~ 0.1 mg) depending on the materials you want to characterize (lipids, proteins, polysaccharides), which is introduced via an autosampler. Py-GC-MS analysis allows you to analyze the sample as it is or after a derivatization reaction which is introduced via an autosampler into the GC.

GC-HRAMS TECHNICAL DETAILS:

- Mass range: 30 to 3000 m/z
- Resolution: 100000 at m/z =272
- Mass accuracy: internal < 1ppm RMS; external <3 ppm RMS
- Electron ionization (EI) source
- Chemical ionization (CI) source
- Scan speed: up to 18 Hz at a resolution setting of 12,500 at m/z 272
- Sensitivity: ppt

PYROLYZER TECHNICAL DETAILS:

- Four analytical techniques available:
  1. Evolved Gas Analysis (EGA-MS)
  2. Single-shot analysis
  3. Double-shot analysis
  4. Heart-cut EGA-GC/MS (HC/EGA-GC/MS)
- Oven temperature control range/temperature stability: ambient temperature +10 to 1050 ºC (1 ºC increments) / within ± 0.1 ºC
- Heating oven heating rate: maximum 600 ºC/min (every 1 ºC/min)

FURTHER INFORMATION:

- Garnier N., Valamoti S. M., "Prehistoric wine-making at Dikili Tash (Northern Greece): Integrating residue analysis and archaeobotany" Journal of Archaeological Science 74 (2016) 195e206

- Evershed R. P., "Organic residue analysis in archaeology: the archaeological biomarker revolution" *Archaeometry* 50, 6 (2008) 895–924 doi: 10.1111/j.1475-4754.2008.00446.x

- Assimopoulou A. N., Papageorgiou V. P. "GC-MS analysis of penta- and tetra-cyclic triterpenes from resins of Pistacia species. Part II.Pistacia terebinthus var. Chia" *Biomedical Chromatography* 19: 586–605 (2005) doi: 10.1002/bmc.484

- Andreotti A., Bonaduce I., Colombini M.P., Gautier G., Modugno F., Ribechini E. "Combined GC/MS Analytical Procedure for the Characterization of Glycerolipid, Waxy, Resinous, and Proteinaceous Materials in a Unique Paint Microsample" Analytical Chemistry 2006, 78, 4490-4500

- Pintus V., Viana C., Angelin E.M., De Sà S. F., Wienland K., Sterflinger K., Ferreira J. L., "Applicability of single-shot and double-shot Py-GC/MS for the detection of components in vinyl acetate-based emulsions used in modern-contemporary art" Journal of Analytical and Applied Pyrolysis 168 (2022) 105782

- Germinario, G.; van der Werf, I.D.; Sabbatini, L. "Chemical Characterisation of Spray Paints by a Multi-Analytical (Py/GC–MS, FTIR, μ-Raman) Approach" *Microchemical Journal* 2016, *124*, 929–939, doi:10.1016/j.microc.2015.04.016.

Referent: Giulia Germinario giulia.germinario@cnr.it