Physical and Chemical Analysis Services

Atomic Spectroscopy

- **Atomic Absorption - Flame:** Quantifies metal ions in various sample types in the **ppm** range. Available lamps at CIEPQPF: Al, As, Ba, Cd, Cr, Cu, Fe, Li, Mn, Mo, Ni, Pb, Se, Si, Sn, Sr, V, Zn, Ca/Mg, Na/K. (Aqueous samples, samples for digestion, and organic solvent samples).
- **Atomic Absorption - Graphite Furnace:** Quantifies metal ions in the **ppb** range. Available lamps: Cd, Cr, Pb, Pt. (Aqueous, digestion-ready, and organic solvent samples).

Thermal Analysis & Properties

- **Thermal Constants Analyzer:** Measurement of thermal conductivity, thermal diffusivity, and heat capacity of solids (non-granular) within the temperature range of **-20 °C to 180 °C**.
- **Elemental Analysis:** Quantifies total nitrogen, carbon, hydrogen, and sulfur in liquid or solid samples.
- **Thermal Analysis (Advanced):** DMTA (Dynamic-Mechanical Thermal Analysis), DSC (Differential Scanning Calorimetry), TGA (Thermogravimetric Analysis), SDT (Simultaneous DSC-TGA).
- **Climatic Chamber:** Temperature and humidity control chamber.

Chromatography

- **Inverse Gas Chromatography (IGC):** Determination of dispersive surface energy components and surface acid-base parameters.
- **Gas Chromatography (GC):** Quantification and identification of components in liquid mixtures (specific to column type).
- **Ion Chromatography (IC):** Quantitative determination of anion and cation concentrations in liquid samples.
- **High-Performance Liquid Chromatography (HPLC):** Quantitative determination of anion and cation concentrations in liquid samples.
- **Gel Permeation Chromatography (GPC/SEC):** Determines number-average molecular weight and molecular weight distribution in polymers.
- **GC/MS:** Gas Chromatography coupled with Mass Spectrometry.

Molecular & Particle Characterization

- **Mastersizer 2000:** Particle size measurement via laser diffraction.
- **Molecular Weight by Light Scattering:** Determination of molecular weight.
- **Viscotek:** Determination of molecular weights for samples dissolved in DMF or THF.
- **Zetasizer Nano ZS:** Characterization of particles/molecules and determination of zeta potential.
- **Sieving:** Particle separation and characterization by size.

Spectrophotometry & Imaging

- **X-Ray Fluorescence (XRF):** Determines the elemental composition of liquid matrices (P, Ca, Zn, Cu, Cl, Si, S, ...).
- **UV/VIS Spectrophotometry:** Identification of compounds in a sample.
- **FTIR Spectrophotometry:** Identification of compounds through infrared molecular vibration.
- **Olympus Optical Microscope:** 5x, 10x, 20x, 40x, and 100x objectives. Equipped with a digital camera (Color VIEW IIIu) for image acquisition.

Physical & Surface Properties

- **Surface Tension Balance:** Measurements of surface tension and contact angle. Sensors: Du Noüy ring and Wilhelmy plate.
- **Electrical Conductivity:** Determination of electrical conductivity in liquids and solids.
- **Vibrating Tube Densimeter:** Density determination of liquids.
- **Digital Refractometer:** Refractive index determination at various temperatures.
- **Specific Surface Area:** Determination of the specific surface area (BET).
- **Speed of Sound Measurement:** Pulse-echo method.

Environmental & Specialized Testing

- **Chemical Oxygen Demand (COD):** Quantifies the COD in a sample.
- **Biochemical Oxygen Demand (BOD) & Respirometry:** Dissolved oxygen determination and respirometric studies.
- **Gas Phase Oxygen Meter:** Measurement of oxygen in gas streams.
- **Nitrogen Meter (Kjeldahl):** Determination of Nitrogen via the Kjeldahl method and total nitrogen in liquid/solid samples.

- **Phytotoxicity:** Seed germination phytotoxicity testing (e.g., *Lepidium sativum*).
- **LUMIStox:** Toxicity determination of liquid samples via light inhibition of *Vibrio fischeri* bacteria.
- **Leaching Test:** Solid-liquid extractions according to international standards (e.g., EN12457, DIN 38414, TCLP, AFNOR, NFX31-210) for landfill compliance.

Sample Processing & Preparation

- **Centrifuges:** Phase separation (Rotofix 32 A).
- **Electrospinning:** Production of polymeric nano/microfibers.
- **Drying & Ovens:** Residue determination and general drying.
- **Solid-Liquid Extraction:** Obtaining non-polar/polar extracts using water and organic solvents.
- **Supercritical CO2 Extractor:** Extraction using supercritical carbon dioxide.
- **Hydrodistillation:** Obtaining volatile/aromatic low molecular weight extracts and non-polar hexane extracts.
- **Freeze-dryer (Lyophilizer):** Material drying via sublimation.

Wet Chemistry & Others

- **Karl Fischer Titration:** Determination of moisture/water content.
- **Total Phenolic Content (TPh):** Determination of phenols in Gallic Acid Equivalents (GAE).
- **Gravimetric Techniques:** Quantification of sulfates.
- **Titrations:** Determination of solution concentration (titer).
- **Rotational Viscometer:** Viscosity determination.
- **Thermo Haake Rheometer:** Measurement of viscous and viscoelastic properties (Controlled Stress, Rate, and Deformation) and oscillatory rheometry.
- **Volatile Solids:** Determination of volatile solids (550 °C) correlated to organic fractions.
- **Insoluble/Soluble Residue:** Determination of residue content.
- **Suspended (TSS) and Dissolved Solids (TDS):** Determination of TSS and TDS in liquid matrices