



Analytical Competence Center (GRD-ACC) – Olen, Belgium – Hanau, Germany
Tel.: +32-14-24 51 49 - +49-6181-59-4032 – <http://intranet.umicore.com/intranet/researchNet>

1. Atomic Spectroscopy

- 1.1. **ICP-OES**
Analysis of main and minor components in solutions and solids (after digestion)
Semi-quantitative screening
High precision analyses
- 1.2. **ICP-MS**
(Ultra-) trace analyses
Semi-quantitative screening
- 1.3. **Spark-OES**
Analysis of main and minor components in metallic samples
- 1.4. **GD-MS**
(Ultra-) trace analyses in metals and semi-conductors
- 1.5. **AAS**
Elemental analyses in divers matrices
- 1.6. **XRF**
Determination of matrix composition in liquids and solids
Semi-quantitative analyses
- 1.7. **Gamma-spectroscopy**
Determination of radioactivity

2. Molecular Spectroscopy

- 2.1. **Infrared spectroscopy**
Characterization of substances
Quantitative analyses
- 2.2. **UV/Vis spectroscopy**
Quantitative determination of substances in solution
Photometric determination of anions, cations and environmental parameters
Turbidity measurements
Determination of color numbers

3. Chromatography

- 3.1. **Ion Chromatography**
Anion analyses in environmental and process samples
Speciation analyses
- 3.2. **GC-FID**
Quantification of organic compounds
- 3.3. **GC-MS**
Semi-quantitative screening of organics
- 3.4. **HPLC (hyphenated to ICP-MS)**
Speciation analyses

4. Element Analysis

- 4.1. **Element analysis**
Analysis of solids and solutions
Carbon, sulfur, nitrogen, oxygen and hydrogen; chlorine
- 4.2. **Carbon analysis**
Analysis of solids and solutions
Total carbon, total organic carbon, non-purgable organic carbon, inorganic carbon
- 4.3. **Chlorine analysis**





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5. Wet chemistry

- 5.1. **Titrimetric and potentiometric methods**
 Acid-base, redox, complexometric (EDTA)
 Titration with ion-selective electrodes
- 5.2. **Physico-chemical parameters**
 Viscosity, density, turbidity
 pH, conductivity, solubility
- 5.3. **(Electro-) Gravimetry**
 Quantitative high precision metals analyses
- 5.4. **Sample preparations**
 Kjeldahl, Wickbold digestions
 Acid-base digestion
 Acid and alkaline melting digestions
 Microwave digestion
- 5.5. **Preparative separations**
 Cognis extraction
 Liquid-liquid extraction
 Soxhlett extraction
 Distillation
 Precipitation techniques

6. Fire Assay

- 6.1. **Fire Assay methods**
 Method of choice for precious metals

7. Phase Characterization

- 7.1. **Electron microscopy**
 Scanning electron microscopy (SEM) and field emission scanning electron microscopy (FEG-SEM)
 Transmission Electron Microscopy (TEM) (in co-operation with external partner)
 Energy dispersive X-ray analysis (EDX)
 Electron back scattered diffraction (EBSD)
- 7.2. **Optical Microscopy**
 Stereo microscopy
 Reflected light microscopy
 Polarized light microscopy
 Digital image processing
- 7.3. **Microprobe**
 Elemental distribution and phase distribution
 Phase composition
- 7.4. **XRD**
 Powder diffractometry with Rietveld refinement
 Crystal structure and size
 Phase identification and quantification
 Crystal structure and crystallite size
- 7.5. **Sample preparation**
 Sawing, embedding, polishing, ion polishing, etching, carbon coating, sputter coating, ultrasonic cleaning





8. Powder characterization

- 8.1. **Particle Size Distribution**
Sieve analysis (mechanical and air jet)
Laser diffraction spectroscopy (dry and wet)
Fisher number
- 8.2. **Other characteristics**
Surface Area (BET)
Density (gas pycnometry)
Bulk density and tap density
Powder flowability (Pfrengle number, flow rate)
Angle of repose

9. Physical properties

- 9.1. **Thermal Analysis**
Thermogravimetry with mass spectrometry (TGA-MS)
Differential scanning calorimetry (DSC)
Dilatometer
- 9.2. **Hardness**
Vickers, Brinell and Rockwell
- 9.3. **Creep (cold)**
- 9.4. **Other characteristics**
Melting point
Flame point
Moisture content
Ash content, loss on ignition, hydrogen loss

10. Other Services

- 10.1. **Failure Analysis**
Expertise on corrosion, physical damage and refractory brick degradation
- 10.2. **Precious metal analysis**
High precision precious metal determinations
Trace analysis of precious metals in any material
- 10.3. **Consulting**
Advice and support on sampling and transportation of samples
Analysis and reports in the frame of REACH
Support in organization and participation of round robins
Consulting in method validation and statistical parameters
Consulting in mineralogical composition of raw products and intermediate products
- 10.4. **Analytical projects**
Introduction of process analytical techniques
Automation projects
Development of new analytical procedures
Trainings on analytical topics
- 10.5. **Other activities**
Preparing certificates of analysis and summary reports
Providing standard solutions, reference materials and reagents