Laboratory Techniques

Purpose

This chapter provides a structured overview of the principal laboratory techniques used across our organization. It serves as a centralized reference for understanding the context, instrumentation, data characteristics, required expertise, and strategic considerations associated with each technique. The goal is to support effective use case development, resource allocation, and cross-functional collaboration within and across business units and sites.

Scope and Structure

Each technique is presented with key attributes, including:

- **Instrument Types & Materials:** Core equipment and sample requirements.
- **Data Classification & Sizing:** Nature, format, and volume of generated data.
- **Expert Skillset:** Typical operator qualifications and training needs.
- **Toolkits & Software:** Commonly used data analysis and management tools.
- **Strategic Fit:** Typical application areas and business value.

Techniques Covered in This Chapter

The following laboratory techniques are detailed in subsequent pages, reflecting industry standards and our internal priorities:

- **Rheology**
  (Viscosity, viscoelasticity, and flow behavior analysis)
- **Mass Spectrometry (MS)**
  (Molecular identification and quantification)
- **Nuclear Magnetic Resonance (NMR)**
  (Molecular structure and dynamics characterization)
- **Infrared Spectroscopy (IR, FTIR)**
  (Functional group and molecular fingerprinting)
- **Ultraviolet-Visible Spectroscopy (UV-Vis)**
  (Electronic transitions and concentration analysis)
- **Chromatography**
  (HPLC, GC, SEC - Separation and quantification of mixtures)
- **X-ray Diffraction (XRD)**
  (Crystallography and phase identification)
- **Thermal Analysis**
  (DSC, TGA - Thermal stability and transitions)
- **Microscopy**
  (Optical, Electron, AFM - Morphology and imaging)
- **Elemental Analysis**
  (ICP-OES, ICP-MS, CHN - Composition determination)
- **Electrochemical Techniques**
  (Potentiometry, voltammetry - Redox and conductivity studies)
- **Particle Size Analysis**
  (Laser diffraction, DLS - Particle distribution characterization)
- **Surface Analysis**
  (XPS, SEM-EDS - Surface composition and morphology)
- **Other Specialized Techniques**
  (To be added as relevant to business needs)

How to Use This Chapter

- **Reference:** Quickly identify the most suitable technique for a given analytical challenge.
- **Planning:** Assess resource and skill requirements for new projects or investments.
- **Collaboration:** Facilitate knowledge sharing and best practice adoption across teams.