

Instrumentation Methods

The instrumentation methods of chemical analysis are divided into various categories according to the property of the samples. Many of the methods can be used for both qualitative and quantitative analyses. The categories of instrumentation methods are as follows:

Spectroscopy

Atomic Absorption Spectroscopy
UV-Visible Spectrophotometer
Fourier Transform Infrared Spectroscopy (FTIR)

Mass Spectrometry

Gas Chromatography Mass Spectrometry (GCMS)

Thermal Analysis

Bomb Calorimeter
Thermogravimetry Analysis (TGA)
Thermal Conductivity (DFX)
Differential Scanning Calorimeter (DSC)
TPD/TPO/TPR Analysis

Separation

Gel Permeation Chromatography (GPC)
Gas Chromatography (GC-FID/TCD) Analysis
Gas Chromatography (GC-TCD) Analysis
High-Performance Liquid Chromatography (HPLC)
High-Performance Liquid Chromatography with Fluorescence Detector (HPLC-FLD)
High-Performance Liquid Chromatography for Sugar Analysis (HPLC-sugar)

Microscopy Analysis

Atomic Force Microscopy (AFM)
Dark Field Microscopy
Scanning Electron Microscopy (SEM)

Particle Analysis

Surface Analyzer
Coulter Porometer
Particle Size Analyzer
Zeta Potential

Electrochemical Analysis

Quartz Crystal Microbalance

Elemental Analysis

CHNS Elemental Analyzer

Polarimetry Analysis

Automatic Polarimeter

Wet Chemical Analysis

Viscometer
Density Meter

Other Analysis

Total Organic Carbon Analysis (TOC)
Titrimetric Water Content

Service Application Procedures

- 1 Customers may contact the respective officer for further information on the testing services before sending samples for analysis.
- 2 Customers should provide information as follows:
 - a) Name and position (staff, student, researcher)
 - b) Details of company (name, address and tel/fax no.)
 - c) Quantity and type of analysis
 - d) Sample description (sample category and sample type)
- 3 The sample should be properly labelled with sufficient quantity and their testing condition for analysis.
- 4 Full payment should be made upon submission of the samples. Modes of payment includes purchase order, bank draft, cheque or cash deposit to be made payable to **USAINS BIOMICS LABORATORY TESTING SERVICES SDN. BHD.**

Policies

- Lead time testing is 4 weeks according to samples queue
- The data/results will be issued after payment is made
- Services will be charged according to the rate agreed by the University

Inquiry

Further inquiry may be addressed to:
School of Chemical Engineering,
Universiti Sains Malaysia,
Engineering Campus,
14300 Nibong Tebal, Pulau Pinang.

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Analytical Testing Services



Introduction

The School of Chemical Engineering was established in May 1992, in the engineering campus, Nibong Tebal. The School is equipped with modern laboratories with the latest equipment to be used for student's training, research and technical services.

Testing Facilities in School of Chemical Engineering

School of chemical Engineering offers a comprehensive scientific and technical laboratory testing services to government agencies and private companies.

The Analytical Laboratory is equipped with many analytical equipment for a wide range of analyses for industries need. The equipment are modern and sophisticated.

List of Testing Services

No.	Equipment	Functions	Sample Requirement
1	Fourier Transform Infrared Spectroscopy (FTIR)	To determine functional group of the compounds in a sample	Liquid/solid
2	UV-Vis Spectrophotometer	To determine the wavelength and maximum absorbance of compounds	Liquid
3	Atomic Absorption Spectrometer	To determine chemical elements such as Cu, Cr, Mn, Mg, Ni, Fe, Zn, Pb, Ag and Cd using the absorption of optical radiation (light) by free atoms in the gaseous state	Liquid
4	Gas Chromatography Mass Spectrometry (GCMS)	To identify chemical compounds of a sample	Non polar sample
5	Bomb calorimeter	To measure the heat of combustion of particular reaction	Solid/Liquid
6	Thermogravimetry Analysis (TGA)	To determine selected characteristics of materials that exhibit either mass loss or gain due to decomposition, oxidation, or loss of volatiles (such as moisture)	Solid
7	Thermal Conductivity (DFX)	To determine thermal conductivity, thermal diffusivity and specific heat capacity define a material's ability to store and transfer heat	Metals (thickness: 3mm-5mm)
8	Differential Scanning Calorimeter (DSC)	To measure the amount of heat absorbed or released by a sample To measure how physical properties of a sample change, along with temperature against time	Solid
9	TPD/TPO/TPR Analysis	To characterize chemical interactions between gaseous reactants and solid substances	Solid
10	Gel Permeation Chromatography (GPC)	To determine molecular weights and weight distributions	Gel/Liquid
11	Gas Chromatography (GC-FID) Analysis)	To separate the compound in non-polar sample	Non polar sample

No.	Equipment	Functions	Sample Requirement
12	Gas Chromatography (GC-TCD) Analysis	To analyse inorganic gases (Argon, Nitrogen, Hydrogen)	Gaseous
13	High-Performance Liquid Chromatography (HPLC)	To separate, identify and quantify each of component in a mixture	Polar sample
14	High-Performance Liquid Chromatography with Fluorescence Detector (HPLC-FLD)	To analyze organic compounds	Organic sample
15	High-Performance Liquid Chromatography Sugar Analysis (HPLC-Sugar)	To separate and analyze sugars	Sugar sample
16	Dark field microscopy	To illuminate unstained sample causing them to appear brightly lit against a dark background	Unstained specimen (not treated with reagent or dye)
17	Scanning Electron Microscopy (SEM) with EDX	To produce high resolution image of sample surface and composition of single element in the sample	Solid/powder
18	Atomic Force Microscopy (AFM)	To measure the roughness of a sample surface at a high resolution, to distinguish a sample based on its mechanical properties (for example, hardness and roughness). To provides a three-dimensional surface profile	Solid
19	Coulter Porometer	To measure pore size distribution	Porous membrane, filters, paper, plastic and thin film
20	Zeta Potential	To measure the charge repulsion/attraction between particles in solution	Liquid (Particle range 0.3nm-10µm)
21	Particle Size Analyzer	To determine the size, average, or mean size of the particles in a powder or liquid sample	Liquid (Particle range from 0.04µm to 2500µm) and dissolve in water

No.	Equipment	Functions	Sample Requirement
22	Surface Analyzer	To measure surface area, pore volume and pore distribution down to mesopore or micropore range	Powder
23	Quartz Crystal Microbalance	To measure a mass variation per unit area by measuring the change in frequency of a quartz crystal resonator	Crystal sample
24	CHNS Elemental Analyzer	To determine carbon, hydrogen, nitrogen or sulfur content in organic and other types of materials	Solid/Liquid
25	Automatic Polarimeter	To measure the angle of rotation caused by passing polarized light through an optically active substance	Liquid
26	Viscometer	To measure the fluid resistance to gradual deformation by shear stress or tensile stress	Liquid
27	Density	To measure volumetric mass density of a substance	Liquid
28	Total Organic Carbon Analysis (TOC)	To measure the amount of carbon in an organic compound	Solid
29	Titrimo Plus Water Content	To determine the water content of a sample	Liquid