TECHNION
Israel Institute of Technology

Department of Materials Science and Engineering
Technion - Israel Institue of Technology

Facilities of the Physical Measurements Laboratory

Lab manager: Inna Zeltser

Room 512, De Jour building

Physical Measurement Laboratory Department of Material Science and Engineering, Technion, Haifa
Link: https://materials.technion.ac.il/en/Research/the-laboratory-for-physical-measurements/
Email: mt.headphlab@technion.ac.il
Telephone: 077-8871365

FT-IR: Thermo Scientific Nicolet iS50

Collect spectrum in the wavelengths range of the IR radiation
(450-4000cm-1)

The system includes:

- ATR accessory-for analysis of solids, liquids and powders
- Smart ARK-horizontal ATR (ZN-Se crystal material)- for analysis of solids liquids and powders. Allows multiple internal reflection
- Transmission accessory-Allows analysis of liquids, thin layers and thin pressed pellets
- OMNIC and OMNIC software allows characterize functional groups, to compare different spectra, identify a mixture of materials, and data processing.
- FT-IR equipped within more than 30 different libraries for molecule identification

TGA: TGA/DSC 3+, Mettler Toledo

- **Thermogravimetric Analysis** (TGA) **measures weight/mass change** (loss or gain) **and the rate of weight change as a function of temperature, time and atmosphere** (Nitrogen or Air)
- **Simultaneously heat flow measurement**
- **Specifications:**

Temperature range	**RT to 1600 °C**
Heating rate	**0.05 to 150 K/min**
Crucible volume	**Up to 900 µL**
Dynamic weighing range	**1g**
Balance resolution	**1 µg**
Weighing accuracy	**0.005%**
Weighing precision	**0.0025%**

The instrument allows determine:

- Thermal and oxidative stability of materials
- Composition of multi-component systems
- Estimated lifetime of a product
- Decomposition kinetics of materials
- The effect of reactive or corrosive atmospheres on materials
- Moisture and volatiles content of materials

DSC: DSC 3+ Mettler Toledo

DSC-Differential Scanning Calorimetry

Specifications:

Temperature range	**-150ºC to 500 °C**
Heating rate	**0.2 to 300 K/min**
Sample	**Solid, liquid**
TAWN resolution (FRS/HSS)	**0.12/0.2**
TAWN sensitivity (FRS /HSS)	**11.9/56**

The instrument allows:

- Determine melting point and enthalpy of fusion
- Crystallization and super-cooling behaviour
- Solid-solid transitions and polymorphism
- Glass transition and amorphous materials
- Chemical reactions, decomposition reactions, vulcanization and polymerization
- Calculate enthalpies of reactions

Porosimetry Micromeritics equipment: 3FLEX

3Flex is a high-performance adsorption analyser for measuring surface area, pore size, and pore volume of powders and particulate materials

- Allows Measurements physical and chemical adsorption
- Analysis Range **1.3 x 10-9 to 1.0 P/P0**
- Measures Surface Area **(BET)**
- The porous distribution (**from non-porous to micro-porous: less 0.4 nm, to meso porous: from 2nm to 50 nm**) and chemical activity of the sample can be measured.
- Measurements can also be performed at high temperatures, up to 1100C with high and precise cooling rates, and also at temperature of liquid nitrogen.
- Different gases can be used for measurements : He, Kr, CO, CO2, H2, N2
- The samples that can be characterized by 3Flex include drugs, ceramics, adsorbents, activated carbon, carbon black catalysts, medical implants, electronic materials, cosmetics

Porosimetry Micromeritics equipment: TriStar II

- **TriStar II 3200 is a high-performance adsorption analyser for measuring surface area, adsorption, pore size, and pore volume of powders and porous materials** (meso-porous: from 2nm to 50 nm)**.**
- **Specifications:**

Total Surface Area:	**Within 0.05 mmHg**
Specific Surface Area	**From 0.01 m^2/g, nitrogen unit**
Linearity 0 to 1.0 P/Po	**Within 0.25% of full scale**
Range	**0-950 mmHg**
Resolution	**Within 0.05 mmHg**
Accuracy	**Within 0.5%**
P/Po range	**0.3 to 1.0 P/Po**

- Area **(BET)** can be measured up to 0.01 m^2/ gr using the standard N2 system. Option Krypton can extend the area measurements up to 0.001 m^2/ gr .
- Micro Active software allows to user interactively calculate the surface area and porous size of the sample. Sophisticated data processing analysis makes it possible to obtain results according to different models like BET, BJH and DFT.
- 3 samples could be measured simultaneously

Porosimetry Micromeritics Equipment: AccuPyc 1340

Gas pycnometer is one of the most reliable techniques for obtaining true, absolute, skeletal, and apparent volume and density

- 10 cc nominal cell volume; contains 1 cc and 3.5 cc cups for smaller volume measurements.
- Using for density measurements of powders, emulsions and foams.
- Automatic device calibration
- The device can use computer software or without (Stand alone).
- The final result is calculated average of several measurements

Practical Trainings on the Lab's Facilities

The practical trainings for operating the following equipment take place in small group of 1-2 participants at the Physical Measurements Lab.

Anyone interested in trainings, please contact Inna Zeltser, Head of the Physical Measurements Lab. Information regarding the instruments and the other laboratory facilities can be found on the lab's site.

Facility	Instrument
FT-IR	**Thermo Scientific Nicolet iS50**
TGA	**TGA/DSC 3+, Mettler Toledo**
DSC	**DSC 3+, Mettler Toledo**
Gas Adsorption analyser I	**3FLEX, Micromeritics**
Gas Adsorption analyser II	**TriStar, Micromeritics**
Gas Pycnometer	**AccuPyc 1340, Micromeritics**