

# Characterisation and Purification of Chemical Substance

## Introduction

Characterization and purification are indispensable processes in chemistry that play a pivotal role in identifying and obtaining pure chemical substances. Characterization involves the analysis of a substance's physical and chemical properties to determine its identity and purity. It encompasses various techniques such as physical properties analysis, spectroscopic methods, chromatography, and microscopy.

Physical properties analysis is one of the primary methods used to characterize substances. Students learn to measure properties like melting point, boiling point, density, and refractive index. By comparing these values with known standards, they can infer important information about the substance, such as its chemical composition and purity.

Spectroscopic techniques, including infrared spectroscopy (IR), nuclear magnetic resonance (NMR), and UV-Vis spectroscopy, are invaluable tools for characterizing organic and inorganic compounds. In the laboratory, students gain practical experience in interpreting spectra to identify functional groups, molecular structures, and impurities in substances.

Chromatography is another essential aspect of characterization. Students are introduced to techniques such as gas chromatography (GC) and thin-layer chromatography (TLC), where they learn to separate and analyze the components of mixtures based on their interactions with a stationary phase. Through chromatography experiments, students develop skills in sample preparation, column packing, and data interpretation.

Microscopy techniques, including scanning electron microscopy (SEM) and transmission electron microscopy (TEM), allow students to visualize the morphology and structure of particles at the microscopic level. By examining samples under a microscope, students can observe characteristics such as particle size, shape, and surface morphology, aiding in the characterization of materials.

Purification, on the other hand, focuses on isolating and removing impurities from chemical substances to obtain high-quality products. Students learn various purification techniques such as distillation, crystallization, extraction, and chromatography. These methods enable the separation of components in mixtures based on differences in physical and chemical properties.

In distillation experiments, students learn to separate volatile components from non-volatile ones by heating the mixture and collecting the condensate. Crystallization experiments teach students to purify solids by dissolving them in a suitable solvent and allowing them to crystallize under controlled conditions. Extraction experiments demonstrate the selective transfer of a compound from one solvent phase to another based on differences in solubility.

## Determination of Melting Point

The melting point of a substance may be defined as the temperature at which the substance changes from the solid state to the liquid state. It is a very useful physical constant because a pure substance melts at a definite temperature and has a sharp melting point while an impure substance has a lower melting point and melts over a wide range. Therefore, the determination of melting point is a very convenient method to check the purity of a solid substance. Moreover, melting point determination can be used to identify a substance by comparing its melting point with the melting points of known substances.