

SEPARATION AND PURIFICATION METHODS

Separation and purification, in chemistry, separation of a substance into its components and the removal of impurities. The separation of mixtures of compounds to give the pure components is of great practical importance in medicinal chemistry. Synthetic reactions give mixtures of products and it is necessary for you to have a reasonably clear idea of how mixtures of compounds can be separated. Almost all compounds of biochemical interest occur naturally as components of very complex mixtures from which they can be separated only with considerable difficulty. For example, the isolation of morphine from poppy seeds or the purification of intermediates/compounds in a multistep organic synthesis for further use.

The most common methods for purification fall into four broad categories—extraction, distillation, crystallization and chromatography. Each are based on slightly different chemical principles in some respects overlapping, in others complementary.

Separations can be achieved by differences in physical properties, such as differences in boiling point, or by chemical means, wherein differences in physical properties are enhanced by chemical reactions.

Methods differ in their scope and range of application. Clearly, a compound must exhibit some degree of volatility under reasonable conditions to be distilled. However, column chromatography can be used to purify a wide array of compounds, whether solid or liquid, polar or non polar, volatile or non volatile. It is sometimes advantageous to use combinations of methods—for example, a “quick and dirty” chromatography column to remove baseline impurities from a complex reaction mixture, followed by a careful distillation to obtain an analytically pure sample.

The classical criteria for determining the purity of organic compounds are correct elemental compositions and sharpness of melting point or constancy of boiling point.