Summary

At the beginning of the twentieth century, the Russian botanist Mikhail Tswett invented and named chromatography. He separated plant pigments by passing solution mixtures through a glass column packed with fine particles of calcium carbonate. The separation of those pigments appeared as colored bands on the column. Tswett named his separation method for the two Greek words “chroma” and “graphein,” which mean “color” and “to write,” respectively (Skoog et al., 1998). In the past six decades, chromatography has been extensively applied to all branches of science. The 1952 Nobel Prize in chemistry was awarded to A. J. P. Martin and R. L. M. Synge for their contributions to chromatographic separations, which tremendously impacted chemistry-related sciences. More impressively between 1937 and 1972, a total of 12 Nobel Prizes were based on working which chromatography was a key tool. In all chromatographic separations, the sample is carried by the mobile phase, which may be a gas, a liquid, or a supercritical fluid. The mobile phase is then percoated through an immiscible stationary phase that is fixed on a solid substrate. When the sample passes through the stationary phase, species are retained to varying degrees as a result of the physicochemical interaction between the sample species and the stationary phase. The separation of species appears in the form of bands or zones resulting from various retentions. Therefore, LC is the predominant technique used in modern analytical separations. Early LC was operated in glass columns, and the mobile phase was driven by gravity. To ensure a reasonable flow rate (F), the column was packed with large particles in the 150 to 200 µm range. Such packing yielded poor results with long separation times, often several hours. Beginning in the late 1960s, small particles were packed in a steel tube, which was subjected to high pressure. Such a system dramatically improved the separation power of column chromatography; in the early years, “HPLC” stood for “high pressure liquid chromatography”. Three to ten micrometers particle diameter (dp) are commonly used as stationary phases in HPLC. Separation can thus be done in a high performance mode, which means high resolution and short analysis time. Therefore, these newer procedures are termed “high-performance liquid chromatography” to distinguish them from the earliest methods.