Chromatography of Polar and Ionic Compounds

Joachim Weiss

Thermo Fisher Scientific GmbH, Im Steingrund 4-6, D-63303 Dreieich, Germany

Leopold-Franzens University, Institute of Analytical Chemistry and Radiochemistry, A-6020 Innsbruck, Austria

Abstract

The lecture will start with a general introduction of ion chromatography covering the definition of this term and the positioning of IC in comparison to other liquid chromatographic techniques. The general introduction will also review the characteristics of the various ion chromatographic techniques and major advantages in comparison to traditional wet chemical techniques, which have been replaced by IC to a large extent.

A major chapter is devoted to the basics of anion exchange chromatography, which highlights the anion exchange process and retention-determining parameters, followed by the discussion of polymeric and silica-based stationary phases. This discussion includes major design concepts and their impact on selectivity and ion-exchange capacity. Typical eluents used in anion exchange chromatography for common inorganic and organic anions as well as the concept of electrolytic eluent generation and purification will be reviewed. The chapter also includes a description of the concept of eluent suppression, including a brief survey of common packed-bed and membrane-based devices. Anion exchange chromatography applications will include the analysis of common inorganic anions as well as polarizable and polyvalent anions. Anion exchange separations of carbohydrates, amino acids, oligonucleotides, and proteins will be covered separately, because the respective eluents and stationary phases differ fundamentally from those used for separating low-molecular weight anions.

In an analogous way, the second major chapter is devoted to the basics of cation exchange chromatography with a brief description of the cation exchange process, the slightly different retention-determining parameters, and an overview of stationary phases being currently in use. Cation exchange applications will include the analysis of alkali- and alkaline-earth metals, transition metals, and the important field of aliphatic and aromatic amines. The only life science application in cation exchange chromatography is again the separation of proteins, especially of truncation variants of monoclonal antibodies.

The third major chapter will review the most important detection systems currently employed in ion chromatography, which can be divided into two categories:

electrochemical and spectrometric methods. The first category includes conductivity detection, the various application forms of amperometry, and charge detection. Spectrometric detection methods such as UV/Vis (direct or in combination with derivatization techniques) and fluorescence will be reviewed briefly, because they are not as significant in IC as they are in RPLC. Much more important today are hyphenated techniques such as IC-ICP/OES, IC-ICP/MS, and IC-ESI/MS, which are discussed in more detail.

The next major chapter will cover the fundamentals, stationary phases, and eluents for ion-exclusion chromatography, which is predominantly used for separating weak inorganic and organic acids as well as alcohols and aldehydes. Respective application examples will be shown.

The last chapter will cover a very topical subject in liquid chromatography such as mixed-mode stationary phases, which are in a way bridging ion-exchange and reversed-phase chromatography. Developed only very recently, mixed-mode phases consist of 3 µm silica-based substrates, which are surface-modified with polar-embedded alkyl chains. The terminal ends of the alkyl chains carry an ion-exchange functional group. These stationary phases are ideally suited for the separation of organic compounds which have a certain tendency to dissociate into an anion or a cation and thus, exhibit a significantly higher selectivity than traditional ion-exchange or reversed-phase columns. Respective examples from pharmaceutical and food industries will be shown.

Termin	Dzień tygodnia	Godzina	Miejsce
28.11.2016	**Poniedziałek**	**9.15.00 – 12.00**	**Minicentrum Konferencyjne (Luwr)**
29.11.2016	**Wtorek**	**9.15.00 – 12.00**	**Minicentrum Konferencyjne (Luwr)**
30.11.2016	**Środa**	**9.15.00 – 12.00**	**Minicentrum Konferencyjne (Luwr)**
01.12.2016	**Czwartek**	**9.15.00 – 12.00**	**Minicentrum Konferencyjne (Luwr)**
02.12.2016	**Piątek**	**9.15.00 – 12.00**	**Minicentrum Konferencyjne (Luwr)**