



Designation: D3016 – 97 (Reapproved 2018)

Standard Practice for Use of Liquid Exclusion Chromatography Terms and Relationships¹

This standard is issued under the fixed designation D3016; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Liquid exclusion chromatography (LEC) began as “gel filtration chromatography” which is attributed to Porath and Flodin.² With the invention of new column packings by Moore³ for organic-phase work a new form of LEC developed which commonly became known as gel permeation chromatography or GPC. Liquid exclusion chromatography is a form of liquid chromatography (some other forms being partition, ion-exchange, and adsorption) and as such is the preferred name for the technique; however, the reader must be aware that other names are common in the literature, the most prevalent being those cited above. LEC differs from all other chromatographic techniques in that only the exclusion mechanism may be operative if meaningful data are to result. Most other chromatographic mechanisms operate in essentially the opposite way, that is, with small molecules exiting first. Any combination of mechanisms causes confusion and is misleading.

Liquid exclusion chromatography as used for the analysis of polymers has grown and matured since the first issuance of this practice in 1972. Therefore, some infrequently used or “outdated” terms have been deleted and some modern practices (or terms) have been included. Modern developments include the use of constant-volume pumps, use of “microparticle” column packings and much smaller columns, and automated data-handling procedures. In addition, SI units as recommended in ASTM Standard [IEEE/ASTM SI 10](#) for Metric Practice are now used.

1. Scope

1.1 This practice covers the definitions of terms and symbols most often used in liquid exclusion chromatography. Wherever possible, these terms and symbols are consistent with those used in other chromatographic techniques.⁴ As additional terms and relationships are developed, they will be incorporated.

NOTE 1—There is no known ISO equivalent to this standard.

1.2 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:

[IEEE/ASTM SI 10 Standard for Use of the International System of Units \(SI\): The Modern Metric System](#)⁵

3. Apparatus Definitions

3.1 *absolute detectors*—devices that sense and measure the absolute concentration or other physical property of solute components contained in the eluate.

3.2 *by-pass or loop injector*—the injector most common in liquid exclusion chromatography and which utilizes a sample chamber that can be filled with sample while it is temporarily external to the flowing liquid stream. It can be manipulated by means of a valving device to sweep the sample with eluent into the column.

3.3 *collection devices*—devices used to collect discrete portions of an eluate according to a preset cycle (for example, times, volume, etc.).

¹ This practice is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.70 on Analytical Methods.

Current edition approved Nov. 1, 2018. Published November 2018. Originally approved in 1972. Last previous edition approved in 2010 as D3016 – 97(2010). DOI: 10.1520/D3016-97R18.

² Porath, J., and Flodin, P., *Nature*, NTRWA, Vol 183, 1959, p. 1657.

³ Moore, J. C., *Journal of Polymer Science*, JPYAA, Part A, Vol 2, 1964, p. 835.

⁴ *Journal of Gas Chromatography*, JCHSB, Vol 66, 1968.

⁵ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.