OPEN ACCESS Freely available online

Journal of Chromatography & Separation Techniques

Commentary

Characterization and Analysis of Macromolecules under Gel Permeation Chromatography

Yukio Murat*

Department of Chemistry, University of Nagoya, Aichi, Japan

DESCRIPTION

Gel Permeation Chromatography (GPC), also known as Size Exclusion Chromatography (SEC), is a powerful analytical technique used for the separation and characterization of macromolecules based on their size. GPC operates on the principle that larger molecules are less likely to penetrate the pores of a porous gel matrix compared to smaller ones. The sample is dissolved in a suitable solvent and injected into the chromatographic system. As the sample passes through the column filled with a porous stationary phase (gel), the larger molecules get excluded and elute first, while the smaller ones penetrate the pores and elute later. The elution time is inversely proportional to the molecular size, allowing the separation of a broad range of molecular weights.

It is a non-destructive technique, which is particularly advantageous when working with sensitive biomolecules. GPC is known for its high accuracy and reproducibility, making it a reliable method for characterizing complex mixtures of polymers. It provides a robust and quantitative assessment of molecular size distributions. The choice of solvent is crucial in GPC as it can significantly impact the separation and resolution of different molecules. Proper selection of solvents and their compatibility with the sample is essential to obtain meaningful results. GPC requires calibration standards with known molecular weights to convert the retention times of sample peaks into molecular weight values. While GPC is a powerful technique, it does have some limitations. It may not be suitable for certain types of samples, such as highly branched or cross-linked polymers, as they may not exhibit proper size exclusion behavior. In such cases, alternative techniques like High-Performance Liquid Chromatography (HPLC) or Gel Permeation Chromatography combined with Light Scattering (GPC-LS) may be more appropriate. GPC is often used in conjunction with other analytical methods, such as Fourier-Transform Infrared Spectroscopy (FTIR), Nuclear Magnetic Resonance (NMR), or Mass Spectrometry (MS), to gain a comprehensive understanding of the composition and structure of macromolecules.

It is used for the characterization and analysis of macromolecules, particularly polymers, based on their molecular size and weight. GPC relies on the separation of macromolecules in a liquid or gel-filled column based on their hydrodynamic volume or size. GPC is widely used in research, quality control, and industrial applications to assess polymer's molecular weight and size. While GPC is a valuable tool, it does have some limitations. The choice of solvent is crucial in GPC as it determines the efficiency of the separation. To determine the molecular weight of unknown polymers accurately, a set of calibration standards with known molecular weights and similar chemical structures should be used.

The choice of standards is essential to cover the range of molecular weights of interest effectively. GPC can be coupled with various detectors, such as refractive index detectors, UV-vis detectors, light scattering detectors, or mass spectrometers.

CONCLUSION

In conclusion, Gel Permeation Chromatography is a vital technique for analyzing polymers and macromolecules based on their size and molecular weight distribution. It has a broad range of applications and plays a crucial role in polymer research, development, and quality control processes. Researchers continue to refine the technique, making it even more powerful for understanding complex polymer systems and supporting advancements in material science and various industrial sectors.

Correspondence to: Yukio Murata, Department of Chemistry, University of Nagoya, Aichi, Japan, E-mail: MurataY99@gmail.com

Received: 19-Jun-2023; Manuscript No. JCGST-23-26041; **Editor assigned:** 21-Jun-2023; Pre-QC No. JCGST -23-26041 (PQ); **Reviewed:** 11-Jul-2023; QC No. JCGST-23-26041; **Revised:** 20-Jul-2023, Manuscript No. JCGST-23-26041 (R); **Published:** 28-Jul-2023, DOI: 10.35248/2157-7064.23.14.525

Citation: Murata Y (2023) Characterization and Analysis of Macromolecules under Gel Permeation Chromatography. J Chormatogr Sep Tech. 14:525.