Research & Reviews: Journal of Pharmaceutical Analysis ISSN: 2320-0812

Instrumentation of Size-Exclusion Chromatography and its Applications

Dinkar Sahal*

Department of Pharmaceutical Analysis, Jamia Hamdard University, New Delhi, India

Perspective

Received: 25-Aug-2022, Manuscript No. JPA-22-77992; **Editor assigned:** 29-Aug-2022, Pre QC No. JPA-22-77992 (PQ); **Reviewed:** 12-Sep-2022, QC No. JPA-22-77992; **Revised:** 19-Sep-2022, Manuscript No. JPA-22-77992 (R); **Published:** 30-Sep-2022, DOI: 10.4172/2320-0812.11.4.005

***For Correspondence:**
Dinkar Sahal, Department of Pharmaceutical Analysis, Jamia Hamdard University, New Delhi, India

E-mail: Sahald97@gmail.in

ABOUT THE STUDY

Size-exclusion chromatography (SEC), also known as Gel Permeation Chromatography (GPC), is a technique for separating analytes based on size, usually in organic solvents. The method is frequently used to analyze polymers. SEC was first created as a method by Lathe and Ruthven in 1955. J.C. Moore of the Dow Chemical Company first studied the method in 1964, which is when the name "gel permeation chromatography" first appeared. The Waters Corporation received a license to use the exclusive column technique, which it then commercialized in 1964. Now, a number of manufacturers also offer GPC systems and consumables. Polymers must frequently be separated in order to be examined and purified into the desired product. The hydrodynamic volume (radius of gyration) or size of the analytes determines how the GPC separates them. This is different from other separation methods, which separate analytes through physical or chemical interactions. Using porous beads arranged in a column, separation is done.

Instrumentation

Practically most of gel permeation chromatography is done in chromatography columns. The experimental layout is not significantly different from previous liquid chromatography methods. In the case of GPC, the proper solvent is used to dissolve the samples, and after filtering the solution, it is injected onto a column. In the column, the multi-component mixture is separated. A pump is used to provide a continuous flow of fresh eluent to the column. A detector is required since the majority of analytes cannot be seen with the human eye. To learn more about the polymer sample, several detectors are frequently utilized. The fractionation is practical and precise since a detector is available.

Gels: For GPC, gels are utilized as the stationary phase. To apply a gel to a specific separation, the pore size of the

gel needs to be precisely managed. The absence of ionizing groups and the gel-forming agent's low affinity for the separated materials in a particular solvent are further desirable characteristics. Commercial gels, such as PLgel and Styragel (cross-linked polystyrene-divinylbenzene), LH-20 (hydroxypropylated Sephadex), Bio-Gel (cross-linked polyacrylamide), HW-20 and HW-40 (hydroxylated methacrylic polymer), and agarose gel, are frequently employed depending on the separation needs.

Column: An impermeable packing material called microporous fills the GPC column. The gel is poured into the column.

Eluent: The eluent (mobile phase) must be an effective solvent for the polymer, allow for a strong polymer detector response, and moisten the packing surface. Tetrahydrofuran (THF), o-dichlorobenzene, and trichlorobenzene at 130–150°C for crystalline polyalkynes and m-cresol and o-chlorophenol at 90°C for crystalline condensation polymers such polyamides and polyesters are the most popular eluents for polymers that dissolve at room temperature GPC.

Pump: For the constant supply of relatively small liquid quantities for GPC, two different types of pumps are available: piston or peristaltic pumps.

Detectors: In GPC, a detector may be used to continually track the polymer concentration by weight in the eluting solvent. There are numerous detector varieties that fall into two broad categories. The first category includes concentration-sensitive detectors, such as UV, IR, differential refractometer (DRI) or refractive index (RI), and density detectors. Low angle light scattering detectors (LALLS) and multi angle light scattering are examples of molecular weight sensitive detectors, which make up the second category (MALLS). The weight distribution of the polymer as a function of retention volume is what results in the chromatogram.

Applications

- The distribution of molecular weights and the relative molecular weight of polymer samples are frequently assessed using GPC.
- The molecular volume and geometry function as determined by the inherent viscosity is measured by GPC.
- The relative data can be used to calculate molecular weights with an accuracy of 5% if comparable standards are applied.
- GPC calibration commonly uses polystyrene standards with dispersities of less than 1.2.
- The separation of proteins, polysaccharides, enzymes, and synthetic polymers is accomplished using the gel permeation chromatography technology.