Dusan Berek, Pharm Anal Acta 2016, 7:2(Suppl)
http://dx.doi.org/10.4172/2153-2435.C1.029

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International Conference and Exhibition on

Advances in HPLC & Chromatography Techniques

March 14-15, 2016 London, UK

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SEC/GPC – A standard but still immature method of molecular characterization of synthetic polymers

Size exclusion chromatography (gel permeation chromatography), SEC/GPC is at present the most common method for molecular characterization of synthetic polymers. Usefulness of SEC/GPC is enormous because it enables fast molecular characterization of polymers in terms of their molar mass averages and dispersities (distributions) – exact data for linear homopolymers and estimates for complex polymers such as copolymers, as well as assessment of molecular parameters of branched polymers, sizes of isolated macromolecules in solution, association and aggregation of polymer species in solution and extent of their preferential solvation in mixed solvents. Consequently, SEC/GPC is a real blessing for science and technology of synthetic polymers, which substantially contributed to their development. Unfortunately SEC/GPC is often applied improperly because several phenomena that can badly affect the quality of results are unknown, underestimated, over looked, or deliberately ignored by many users. Sometimes, SEC/GPC results are inadvertently or intentionally misinterpreted or even misused to support the incorrect conclusions. Basics of the SEC/GPC will be briefly outlined. The drawbacks, shortages, and pitfalls of SEC/GPC will be discussed more in detail with the aim to furnish essential information to the method users who may want to ameliorate the quality of their results and seek explanation of some unexpected outcomes of measurements. The role of column porosity, enthalpic interactivity, as well as their history will be demonstrated. The effect will be discussed of experimental conditions, especially mobile phase type and purity, injected sample concentration and volume on the precision of data obtained. It will be demonstrated that SEC/GPC still needs further development and that the standardization of sample preparation, measurement, and processing of results is necessary.

Biography

Dusan Berek graduated with an honor in Master of Chemical Engineering from the Slovak Technical University in Bratislava. He did his PhD thesis at Polymer Institute, Slovak Academy of Sciences in Bratislava and Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences in Prague. He was employed at Polymer Institute, Slovak Academy of Sciences (PI SAS) in Bratislava since 1960. He was an elected member of the Presidium of the Slovak Academy of Sciences from 1992-1995. He served as President of the Slovak Chemical Society, Chairman of the Czecho-Slovak and Slovak National Committee of Chemistry for the International Union of Pure and Applied Chemistry and as Member of the Board of the Federation of European Chemical Societies. He is the author or co-author of two monographs on liquid chromatography and 250+ scientific papers *in extenso* published in refereed periodicals (150+ in the Current Contents covered Journals), and in proceedings and chapters of books, as well as 60+ patents (four of them were licensed) - cited more than 2,000 times in SCI journals and monographs.

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