ANALYSIS OF COMPLEX POLYMERS BY MULTIDIMENSIONAL TECHNIQUES: HPLC AND 2D CHROMATOGRAPHY, INFRARED AND MALDI-TOF DETECTORS

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ABSTRACT

Complex polymers are distributed in more than one direction of molecular heterogeneity. In addition to the molar mass distribution, they are frequently distributed with respect to chemical composition, functionality, and molecular architecture. For the characterization of the different types of molecular heterogeneity it is necessary to use a wide range of analytical techniques. Preferably, these techniques should be selective towards a specific type of heterogeneity. The combination of two selective analytical techniques is assumed to yield a two-dimensional information on the molecular heterogeneity.

The present conference paper discusses the principle ideas of liquid chromatography of polymers, including size exclusion and interaction chromatography. In particular, chromatographic techniques sensitive towards chemical composition, such as gradient polymer elution chromatography (GPEC) and chromatography at the critical point of adsorption (LC-CC) will be highlighted both theoretically and experimentally. The analysis of functional homopolymers, random and block copolymers, and polymer blends by different techniques will be discussed.

The full potential of polymer chromatography is used best in multidimensional analysis schemes. Most promising protocols for hyphenated techniques refer to the combination of two different chromatographic methods and the combination of chromatography and spectroscopy. For example, via on-line coupling of LC-CC and SEC, telechelics and macromonomers can be analyzed with respect to functionality and molar mass. The analysis of the grafting process by coupled LC-CC with SEC and FTIR yields important information on the reaction mechanism and the grafting success.

Finally, this paper reviews the basic principles of two-dimensional chromatography and the hyphenation of liquid chromatography with selective detectors. In particular, a number of applications using FTIR and MALDI-TOF detection will be given.

References:

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