

ADVANCED POLYOLEFIN ANALYSIS

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ABSTRACT

Complex polyolefins 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, branching, 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 two-dimensional information on the molecular heterogeneity.

For the analysis of complex polyolefins different liquid chromatographic techniques have been developed, including high-temperature size exclusion chromatography (HT-SEC) separating with respect to hydrodynamic volume, and high temperature gradient chromatography (HT-HPLC) which is used to separate according to chemical composition. These are important complementary techniques to the classical crystallization based techniques (TREF, CRYSTAF).

The present lecture presents the principle ideas of combining different analytical techniques in multidimensional analysis schemes for complex polyolefins. Most promising protocols for hyphenated techniques refer to the combination of two different chromatographic methods and the combination of chromatography and spectroscopy. The basic principles of high-temperature two-dimensional chromatography and the hyphenation of SEC/HPLC with selective detectors such as ^1H -NMR, FTIR and DSC will be discussed.