
Preface

Liquid chromatography is one of the workhorses in the analysis of polymers. When it comes to the determination of the molar mass distribution, there is no other technique that can compare with size exclusion chromatography in terms of accuracy and reliability. However, size exclusion chromatography separates according to the size of the macromolecules and not molar mass, and has its limits when complex polymer systems must be analyzed.

Complex polymer systems such as random, block and graft copolymers, polymer blends, telechelics and macromonomers necessitated liquid chromatography to be used not only for molar mass determinations but also for evaluation of the chemical heterogeneity and the functionality type distribution. Powerful methods for this task include liquid adsorption chromatography and liquid chromatography at the critical point of adsorption. To address multiple distributions of molecular parameters in complex polymers, multidimensional fractionation and analysis techniques have been developed, most prominently comprehensive two-dimensional liquid chromatography.

A number of text books on liquid chromatography of polymers have been published over the years covering the fundamentals of the different techniques. In our textbook 'HPLC of Polymers' we addressed the experimental aspects of the different techniques, in particular in interaction chromatography, and gave detailed instructions for conducting experiments using the diverse techniques. Since experiment is always the proof of the theory, we intended to give an introduction into liquid chromatography by proposing a number of more or less simple experiments. 'HPLC of Polymers' was published in 1998 and became quite popular as a basis for teaching polymer chromatography courses.

Over the last 15 years polymer chromatography advanced significantly with comprehensive 2D-LC becoming more and more a 'routine' method. New coupling techniques have been developed including LC-NMR and LC-MALDI-TOF. It became even possible to analyse complex polyolefins by high-temperature 2D-LC. Considering these new developments we thought that the time had come to update and extend the previous 'HPLC of Polymers' book by focusing on multidimensional separation methods. The result of our efforts is the present textbook

‘Multidimensional HPLC of Polymers’ that intends to review the state of the art in polymer chromatography and to summarize the developments in the field during the last 15 years.

Similar to the previous textbook, this laboratory manual is written for beginners as well as for experienced chromatographers. The subject of the book is the description of the experimental approach to the analysis of complex polymers. It summarizes important applications in liquid chromatography of polymers with emphasis on multidimensional experiments. The theoretical background, equipment, experimental procedures and applications are discussed for each separation technique. It will enable polymer chemists, physicists and material scientists, as well as students of polymer and analytical sciences to optimize experimental conditions for a specific separation problem. The main benefit for the reader is that a great variety in instrumentation, separation procedures and applications is given, making it possible to solve simple as well as sophisticated separation tasks.

This book is dedicated to friends and colleagues that contributed (directly or indirectly) to this book by pioneering HPLC, cross-fractionation and multidimensional chromatography of polymers, among others Steve Balke (Canada), Gottfried Glöckner (Germany) and Sadao Mori (Japan), Boris Belenkii, Victor Evreinov and Alexander Gorshkov (Russia), Yefim Brun (USA), Peter Kilz, Helmut Much and Günter Schulz (Germany), Taihyun Chang (Korea), Peter Schoenmakers (The Netherlands), Tibor Macko and Wolf Hiller (Germany).

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