Mass Spectrometry of Polymers – New Techniques

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Preface

Mass spectrometry has become an irreplaceable tool for the characterization of ever more advanced polymer structures and polymer compositions. Considering the rapid developments in the field of mass spectrometry and the appearance of new interesting techniques, I am sure that in the coming years mass spectrometry will even further strengthen its position as an invaluable polymer characterization tool. The potential is still far from being fully exploited. Chapter 1 of this book reviews newer mass spectrometric techniques that are emerging or being established as polymer characterization tools. Here, ambient desorption ionization-mass spectrometry techniques, which offer intriguing new possibilities for direct analysis of polymer surfaces, are typical examples.

Chapter 2 presents liquid chromatography–mass spectrometry and capillary electrophoresis–mass spectrometry techniques for analysis of low-molecular weight additives and impurities in polymeric materials. This is an important area as we become more and more aware of our environment and the potential influence of chemicals. The total composition and possible migration of additives and unknown degradation products from polymers is thus of outmost interest. Many regulations already exist concerning the composition of, for example, food contact materials and medical materials, and new regulations can be expected in an increasing number of fields. Chapter 3 concerns direct insertion probe-mass spectrometry of polymers. Many characterization techniques require dissolution of the sample. Some polymers are, however, not soluble. In Chap. 3, examples of the application of direct insertion probe-mass spectrometry for structural and compositional analysis of cross-linked, or for other reasons, insoluble polymers are given. In addition, applications for thermal stability and decomposition mechanism studies are demonstrated.

Mass spectrometry is also an increasingly important technique for structural characterization of biomolecules. With the ongoing change from petroleum-based to bio-based materials, the proper characterization of biomolecules, as well as various monomers and intermediates from renewable resources, is an area of increasing importance. Chapter 4 summarizes the current knowledge in mass spectrometric characterization of oligo-and polysaccharides and their chemical

modifications. The last chapter explores the potential of electrospray ionization-mass spectrometry in revealing the molecular level reactions and changes taking place during polymer degradation. The improved understanding of degradation reactions is crucial for the development of more stable and inert polymeric materials, as well as for the development of truly environmentally benign degradable materials with controlled degradation mechanisms. Finally, I would like to thank all the authors who contributed to this book. I am convinced that a wider use of mass spectrometry in polymer analysis will increase our understanding of these fascinating materials with enormous structural variety. This in turn will lead to faster development of better functioning and more sustainable polymer products. I hope this book will inspire more people to explore the world of mass spectrometry for molecular level understanding of the multilevel complexity of polymeric materials.

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