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Mass spectrometry for forensic engineering of advanced polymer materials

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Forensic engineering of advanced polymer materials (FEAPM) deals with the evaluation of the relationships between their structure, properties and behavior before, during and after practical applications. It is of particular importance in the case of nanomaterials and their nano-safety, biodegradable polymer materials as well as nanocomposites. The *ex-ante* investigations as well as the *ex-post* studies are needed in the area of FEAPM in order to increase efficiency and to define and minimize potential failure of novel polymer products before and after specific applications. Due to the wide spectrum of their potential applications e.g.: In medicine, in the field of compostable polymer packages (especially of long-shelf life products such as cosmetics or household chemicals) as well as in agrichemical formulations the FEAPM can provide basic knowledge and a valuable service by increasing understanding and helping prevent future problems. Such approach helps to design novel biodegradable polymer materials and to avoid failures of the commercial products manufactured from them. It also opens a wide opportunities for FEAPM mass spectrometry.Contemporary report on the MS applications for forensic engineering of natural aliphatic (co)polyesters (PHA) and their synthetic analogues, formed via anionic ring-opening polymerization of β-substituted *β*-lactones, will be presented. Special emphasis will be given to the results of ESI-MS ecotoxicological studies of polyester blends containing atacticpoly(3-hydroxybutyrate). Furthermore, the use of environmentally friendly polymers as packaging materials for long shelf-life applications is the new trend for production. Thus, the results of the ESI-MS^n investigations on PLA materials for cosmetic packages will be presented based on the studies of both the eroded polymer and its degradation products formed in paraffin and selected protic media.

Biography

Marek M Kowalczuk received his PhD degree in 1984 from the Faculty of Chemistry, Silesian University of Technology, and DSc degree in 1994 at the same University. He was a visiting Lecturer at the University of Massachusetts in Amherst, MA, USA in 1990 and Marie Curie EU fellow at the University of Bologna, Italy. Currently, he is Professor at the University of Wolverhampton, UK and at the Centre of Polymer and Carbon Materials, Polish Academy of Sciences, Zabrze, Poland. He is the author and co-author of over 120 scientific papers and a score of patents. His research interests arenovel mass spectrometry techniques for analysis of polymers at the molecular level, mechanisms of anionic polymerization related to the synthesis of biodegradable polymers possessing desired architecture, forensic engineering of biodegradable and functional polymers.

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