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# Polymer Blends

A Comprehensive Review

ISBN-10: 3-446-22569-2

ISBN-13: 978-3-446-22569-5

Vorwort

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## Preface

The field of polymer blends has been one of the most prominent areas of investigation in polymer science in the past several decades. In 1967, when the author started his professional career, polymer blend technology was virtually at the beginning with miscibility in polymer blends believed to be extremely rare if not basically impossible. The technology involved with the compatibilization of immiscible polymer blends was yet to be developed. The fundamental relationships covering the thermodynamics of polymer blends were at least partly developed but concepts including equation of state thermodynamics did not exist. The field of polymer blends has an analogy with metal alloys, and the technology development over the past four decades has well-established the principles and practice leading to significant commercial successes. The search for new materials to solve the materials needs for emerging applications now often relies on polymer blend solutions. With four decades of research in this area by the author, a perspective of the developments in this technology is hopefully presented illustrating the significant developments as the polymer blend technology matured.

A prior book on polymer-polymer miscibility (Academic Press: 1979) was coauthored, and this author did not remember how time-consuming a book preparation can be and embarked on this book almost five years ago resulting in a lot of long nights and weekends. This book covers the broader field of polymer blends and is both an introduction and a reference text. As an introduction it does not cover the subject material in the depth found in references dedicated to specific subsets of the field. As a reference text, sections of the book are highly referenced and limited in detailed discussion and may unfortunately be boring reading. While a number of excellent books exist on polymer blends, it is hoped that this book provides a broad overview of the field with seminal references as well as recent references of interest. Many of the available books on polymer blends are edited texts offering detail in the subject areas covered. Several excellent authored texts are also available covering specific aspects of polymer blend technology although generally not as comprehensive and also not recent. Hopefully, this book can cover the entire field and update the many recent contributions to the subject.

The author has split his career at two companies (Union Carbide: 1967–1986; Air Products and Chemicals, Inc.: 1986–2007). The author wishes to acknowledge the strong commitment of both companies to technology and the ability to conduct research in an atmosphere dedicated to strong professional development. The supportive management in both companies provided the encouragement to be involved with the broader technology community and ultimately undertake the significant effort involved with preparation of the polymer blend reference texts. Over the years, the author has been able to meet and discuss the subject area with the leaders in the field. One key leader that deserves special acknowledgement is Dr. Donald R. Paul of the University of Texas. His contributions to the field are well-documented in this text as well as specific figures from his publications. His review of the manuscript offered many important corrections and additions. Other prominent investigators in the field whose input and discussions over the years is greatly appreciated include Drs. M. T. Shaw and O. Olabisi (coauthors of the first book noted above), Drs. F. E. Karasz, W. J. MacKnight, J. W. Barlow, J. E. Harris, J. E. McGrath, R. A. Weiss, A. Eisenberg, J. V. Koleske, L. A. Utracki, L. H. Sperling, M. M. Coleman, C. B. Bucknall, G. Groeninckx, D. G. Baird, L. P. McMaster, M. Matzner, Ph. Teyysie, L. M. Maresca, E. M. Pearce and my apologies for not noting the many others which have influenced the content of this book. Specific figures were kindly

obtained from Drs. R. J. Spontak and D. G. Baird offering important morphological illustrations so important to a book on polymer blends. Rough drafts of this book were utilized in the CHE/CHM/MAT 485 course on Polymer Blends and Composites taught at Lehigh University. The comments of the students (not always favorable and rightfully so) were quite helpful in the preparation of the book in the final version. The author wishes to acknowledge the helpful comments and suggestions made on requested reviews of various chapters of the book by Drs. L. H. Sperling, M. T. Shaw, O. Olabisi, F. L. Marten, and C. D. Smith. The assistance of Linda Schanz in providing computer process related advice and figure reproduction is also greatly appreciated.

Finally, I wish to acknowledge the important contribution of my family. My mother taught me mathematics and reading at an early age (before elementary school) and my father instilled in me the 'midwestern work ethic' (although I wasn't always sure I wanted to learn it). That provided the basis for obtaining the skills necessary to accomplish the task of this endeavor. My wife, Saundra, has always been very supportive of the long hours and tables filled with references around the house as I prepared this book. Without that support, this book would never have been completed.

Spring 2007

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