Preface

This book offers a comprehensive view of fiberglass and glass technology with emphasis on energy-friendly compositions, manufacturing practices, and applications, which have recently emerged and continue to emerge. Energy-friendly compositions are variants of incumbent fiberglass and glass compositions. They are obtained by reformulation of incumbent glass compositions in order to reduce the melt viscosity and increase the melting rate, thereby saving process energy and reducing environmental emissions. As a result, new energy-friendly compositions are expected to become a key factor in the future for the fiberglass and glass industries. The contributors to the book consist of both academic and industrial scientists. This book is therefore dedicated to those in the academic and industrial community who seek an understanding of the past in order to make progress in the future.

This book consists of three interrelated sections. Part I reviews a wide range of continuous glass fibers, their compositions, and properties. Dr. F. T. Wallenberger authored Chapter 1, which reviews important glass fibers ranging from commercial 100% SiO2 glass fibers and commercial multi-oxide glass fibers to experimental glass fibers containing 81% Al₂O₃. Dr. Wallenberger also authored Chapter 2. This chapter offers a new method (trend line design) for designing environmentally and energy-friendly E-, ECR-, A-, and C-glass compositions to reduce the process energy by compositional reformulation. Few fiberglass applications are based on yarns; most are based on composites. Dr. J. H. A van der Woude and Dr. E. L. Lawton authored Chapter 3, which reviews fiberglass composite engineering with an important sub-chapter on windmill blade construction. Dr. A. V. Longobardo wrote Chapter 4. It reviews the glass fibers which became available as reinforcement for printed circuit boards and analyzes their compositions as well as the needs of the market. Finally Dr. R. L. Hausrath and Dr. A. Longobardo authored Chapter 5, which reviews high-strength glass fibers and analyzes existing and emerging markets for these products.

Part II of the book deals with soda–lime–silica glass technology. The first two chapters (Chapters 6 and 7) parallel the first two chapters in Part I (Chapters 1 and 2). Dr. Ing. A. Smrček wrote Chapter 6. It is devoted to a wide range of industrial flat, container, and technical glass compositions and to an in-depth review of their properties. Dr. P. A. Bingham authored Chapter 7. It deals with the design of new

energy-friendly flat, container, and technical glass melts through reformulation of existing compositional variants to reduce the process energy.

Part III of the book deals with emerging glass melting science and technology, and is conceptually applicable to both glass and fiberglass melts. Prof. Dr. H.-J. Hoffmann authored Chapter 8, which offers new insights into the basics of melting and glass formation at the most fundamental level. Prof. Dr. R. Conradt wrote Chapter 9, which deals with the thermodynamics of glass melting, offers a model to predict the thermodynamic properties of industrial multi-component glasses from their chemical compositions, addresses the role of individual raw materials in the melting process of E-glass, and facilitates the calculation of the heat of the batch-to-melt conversion. Prof. Dr. H. A. Schaeffer and Priv. Doz. Dr.-Ing. H. Müller-Simon authored Chapter 10, which reviews the use of in situ sensors for monitoring glass melt properties and monitoring species in the combustion space and also reviews redox control of glass melting with high levels of recycled glass to enhance the environmentally friendly value of the resulting glass. Dr. R. Gonterman and Dr. M. A. Weinstein authored Chapter 11, which deals with the recently emerging plasma melt technology and its potential applications.

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