Preface

This book is intended as an introductory level text for the student or professional scientist or engineer interested in glass science and technology. It is assumed that the reader has little, if any, prior knowledge of glass science. As a direct consequence, the material is deliberately limited to that which can be covered in a single semester of course work. Restriction of the information to this level prevents the common problem of overwhelming the student by presenting material better left to an advanced level course.

The material in this text is presented in the order used when teaching "Introduction to Glass Science" at the New York State College of Ceramics at Alfred University. In teaching this material, I find it useful to first define "glass", specify those aspects of glasses which make them different from other materials, and discuss the historical development of glass technology. Following this introduction, the text addresses the questions of how glasses are produced and why some materials form glasses while others do not. The next two chapters of the text deal with the atomic arrangement and microstructure of glasses, with an emphasis on understanding of the basic principles of network structures and the details of phase separation. The next seven chapters discuss the properties of glasses, including viscosity, thermal expansion and density, properties controlled by transport phenomena, mechanical properties, optical behavior, the effect of water on glasses and melts, and the application of thermal analysis to the study of glass. The final two chapters present an overview of classical and specialized forming methods used to produce commercial products, and the properties of a number of common commercial glasses.

This text includes routine discussion of the effects of phase separation and crystallization on the properties of glasses. These effects are essentially neglected in other texts on glasses. Since many modern glasses are phase separated, this neglect is no longer justified. Many papers published today have incorrectly interpreted the results of both spectral and property studies, due to a lack of understanding of the effects of phase separation on the details of the behavior of glasses.

A limited number of exercises are included at the end of many of the chapters. Answers to these exercises for this text can be obtained by direct request to the author at the New York State College of Ceramics, Alfred, NY 14802.