GLASSES FOR PHOTONICS

This book is an introduction to recent progress in the development and application of glass with special photonics properties. Glass has a number of structural and practical advantages over crystalline materials, including excellent homogeneity, variety of form and size, and the potential for doping with a variety of dopant materials. Glasses with photonic properties have great potential and are expected to play a significant role in the next generation of multimedia systems.

Fundamentals of glass materials are explained in the first chapter and the book then proceeds to a discussion of gradient index glass, laser glasses, non-linear optical glasses and magneto-optical glasses. Beginning with the basic theory, the book discusses actual problems, the performance and applications of glasses. The authors include much useful background material describing developments over the past 20 years in this rapidly moving field.

The book will be of value to graduate students, researchers and professional engineers working in materials science, chemistry and physics with an interest in photonics and glass with special properties.

MASAYUKI YAMANE was born on April 18, 1940 in Kanagawa, Japan. He received his doctor's degree in engineering from Tokyo Institute of Technology in 1968 and joined the academic staff of the Department of Inorganic Materials at Tokyo Institute of Technology in April, 1968, and is now professor. He has worked at Rensselaer Polytechnic Institute, UCLA, the University of Rochester and Université Pierre et Marie Curie. His research is into glass science and technology and sol-gel processing. He has published more than 140 papers on the structure, mechanical properties, optical properties, homogeneity, crystallization, phase separation and sol-gel processing of glasses. He has authored or contributed to 18 books on glass science and engineering. He received the Scientific Award from the Ceramic Association of Japan in 1989.

YOSHIYUKI ASAHARA was born on February 18, 1940 in Fukuoka, Japan. He received his first degree in physics from Tokyo Metropolitan University in 1964 and his doctor's degree in engineering from Kyoto University in 1976. He was with the Materials Research Laboratory of Hoya Corporation from 1964 until 1996 engaged in research and development of new glasses for opto-electronics. His work involved ultrasonic delay line glass, Faraday rotator glass, chalcogenide glasses for optical memory and gradient refractive index fabrication technology. In the past decade his research has been into photonics glass materials, such as nonlinear optical glass and waveguide laser glasses. During this period he was a part-time lecturer at Tokyo Institute of Technology and guest professor at Kyushu University. Dr Asahara has published more than 40 papers on optoelectronics and photonics properties of glasses, and has contributed to 12 books on optoelectronics and photonics. He received the Technical Award from the Ceramic Association of Japan in 1984, the Centennial Memorial Award from the Ceramic Society of Japan in 1991 and the Progress Award from the Laser Society of Japan in 1993.

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MASAYUKI YAMANE
Professor, Tokyo Institute of Technology
AND
YOSHIYUKI ASAHARA
Photonics Technology Advisor

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Contents

Preface

Glass can be doped with rare earth ions, high refractive index ions and micro-crystallites which give it great potential as a photonic medium. The practical advances of these types of glass are expected to have significant roles in multimedia systems in the next generation.

This book is thus an introduction to the theory and recent progress in the technology of glass with special photonic properties, for graduate students, practising engineers and scientists, who wish to supplement their theoretical and practical knowledge of this field with the material science aspects. Hence, this book is intended to be comprehensive enough for an introductory course and be easily readable by practising engineers who are interested in and desire an overview of this field.

Although this book is designed with the purpose of providing a fundamental review of materials with special optical properties, another goal is to provide practical and useful information about developments over the last 10 years in this rapidly changing field. It is impossible, however, to describe all the innovations which have been developed over the last 10 years and omissions are inevitable in a compilation of the size of this book. References to work with respect to the range of glasses examined in this book are given as references to the tables in each chapter. Readers interested in specific data will be able to refer to the original literature. Even so, there remains the possibility of serious omission, for which we beg, in advance, the reader's pardon.

M. Yamane and Y. Asahara