

PREFACE

Rheology as the science of deformation and flow is today well recognized. Dissemination of knowledge of rheology and of its importance in a rapidly increasing number of fields has come about in large part through the years of activity of the American and British Societies of Rheology and of the more recently founded societies and committees in Brazil, France, Germany, Holland, Italy, and Japan. Valuable information in the varied fields of rheology has been made available through the Transactions of meetings of these groups and of the International Rheological Conferences of 1949 and 1953 as well as through recent monographs.

However, searching for information on specific rheological questions only too often turns out to be disappointing. As a rule, it is necessary to consult a large number of books and papers, to piece together evidence, and to adapt a number of assumptions to the case. Often unfamiliarity with rheological concepts and nomenclature presents an additional difficulty.

It is no exaggeration to state that there is no research or production laboratory in which rheological problems of one kind or another are not likely to present themselves at some time, and in many laboratories such problems arise all the time. Searches for information are, therefore, frequent.

In this book noted workers in rheology have pooled their knowledge and made it easily available in condensed form. The contributions although self-contained are interrelated. They are so planned that scientific workers are introduced to well-demarkated areas of rheology through introductory and descriptive material which then leads into integrated surveys of the present knowledge in these areas. The careful selection of topics, the authoritative and well-documented chapters, and the comprehensive index of this book all combine to further an awareness that the general concepts and laws of rheology form an entity. Furthermore, it offers the novice a very general introduction to many topics, and the advanced reader a ready means of comparing the different viewpoints of the contributing authors and of studying new material in fields related to rheology.

Thus it is hoped that this book will be instrumental in bringing about a better understanding of the essential unity of rheology. For although the applicability of many of the basic laws is generally accepted among rheologists, we are far from achieving the full benefits that can come from a more complete interchange of theories and applications among the various fields of rheology.

All of these factors were in the mind of the Editor when he asked his

colleagues to contribute to this volume and the two succeeding volumes that will comprise this work. Thanks are due to the contributors for their careful preparation of articles in this rapidly growing field. It is to be hoped that their efforts will benefit many and will serve to stimulate others to further activities in all branches of research.

In the present volume, the first of three, the reader will find two introductory chapters, one from the physicochemical and the other from the physics and engineering angle, followed by five chapters on various phases of the deformations of solids. The paper on flow under high pressures leads to those on the mechanism of liquid flow, large elastic deformations, viscoelasticity, and melt flow. Four chapters on the basis of the rheology of disperse systems and one on acoustic responses of liquids complete this part.

Volume II will open with an integrated survey which will serve to link the fifteen chapters, woven through the three volumes of the book, that deal with various fields and aspects of linear viscoelasticity. Volume II will continue with relaxation theory and three chapters on experimental techniques; then there follows the series of chapters on special types of materials or behavior such as the relaxation of polymers, the rheology of elastomers, glasses, cellulose derivatives, and fibers; it will include also chapters on concrete and on seismic measurements.

Volume III will contain more specialized chapters, on crystalline and on cross-linked plastics, polyelectrolytes, latexes, inks, pastes, and clay. This part will conclude with a series of technological articles on lubrication, spinning, molding, extrusion, and adhesion and a survey of the general features of industrial rheology.

When this work was planned, it was hoped that a uniform nomenclature might be achieved throughout. It was soon found that, especially in view of the diversity of the work, the time was not ripe for such an undertaking. To help the reader to compare derivations and data, a list of symbols has been appended to each chapter.

The variety, and often variance, of rheological terms employed today presented a major difficulty also in the way of preparing a consistent index commensurate with the purpose of this treatise. It is hoped that for those less acquainted with general rheology the grouping and bracketing of terms as well as the many cross references will help to clarify the synonymity or interrelation of concepts used today by different authors in different fields.

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