

main outlines of the theory, practice and use of this technique would be helpful. The very range of its usefulness has already made it impossible to give an adequate treatment of all its uses and emphasis has therefore been concentrated on macromolecular chemistry where the development has been most spectacular. Since the appearance of new work is so continuous no attempt has been made to be encyclopaedic but it is hoped that a general view will help to show, particularly to the new-comer to this technique, its potentialities and limitations in physical chemistry."

We have just quoted the author's words in the preface to this useful little book. They tell the author's purposes; in this reviewer's opinion they are well carried out.

After a short introduction the serious part of the book begins with a chapter on basic theory. In some respects this is disappointing. The reader searching for an accurate and critical discussion of the theory will not find it here; however, he will find an introduction to the ideas and the formulas used to interpret experimental data. The author is hardly to be blamed for the limitations of this chapter, in that these limitations really reflect the confused state of the literature. In this reviewer's opinion ninety per cent. of the published papers on the theory of light scattering of the past forty years will have to be disregarded when the definitive survey is written.

The following chapter, on experimental methods, is much better. In forty-three pages it describes nearly every important apparatus design that has been published; it also discusses calibration and the results of the determination of the scattering powers of pure liquids, which have led to considerable controversy. The section on corrections for refraction effects is perhaps too condensed for easy intelligibility, but it serves as a useful guide to the literature.

The next three chapters on the application of light scattering to high polymers, proteins and polyelectrolytes are to be highly recommended. They describe practically everything that has been done, and for the most part, clearly and accurately. This is a commendable achievement, and probably will remain a unique one, since progress is so fast that a complete review of all these fields will soon be impracticable. The following is a sampling of topics treated: polymer-solvent interaction, size of polymer coils, molecular weights of miscellaneous proteins, antigen-antibody reactions, effect of charge, shape and size of polyelectrolytes, nucleic acids, micelle formation.

This book is a necessity for any one engaged in light scattering work and in addition should be of interest to any worker in the fields of macromolecular and colloidal chemistry.

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Trocknungstechnik. Volume I. By O. KRISCHER AND K. KRÖLL. *Die wissenschaftlichen Grundlagen der Trocknungstechnik.* By O. KRISCHER, a.o. Professor an der Technischen Hochschule, Darmstadt. Springer-Verlag, Reichpietschufer, West Berlin W 35, Germany. 1956. xix + 400 pp. 16.5 × 23.5 cm. Ganzleinen DM 46.50.

This book is the first of two volumes, under the general heading *Trocknungstechnik*. It deals with the scientific principles of the drying of solids. The author of the first volume, O. Krischer, has presented the fundamentals of the drying of solids in eleven chapters. A certain amount of the material presented is derived from journal articles published by Krischer over the past twenty years, as well as other literature data on heat and mass transfer.

The subject matter of the book deals with phenomena peculiar to the drying of wet solids. General aspects of heat and mass transfer familiar to chemical engineers are also summarized.

Chapter I treats material and energy balances in drying; the properties of gas-vapor mixtures and their graphical representation on enthalpy-concentration charts; the nature of the binding forces between liquids and solids and the resulting equilibrium moisture content relationships with numerous curves of equilibrium moisture for a large number of materials.

Chapter II deals with well-known heat transfer concepts, and is essentially a review of radiation, conduction and convection with a summary of recent data on these methods of heat transfer. Special attention is given to heat transfer

within porous solids, in particular, a rather complete summary of available data on the thermal conductivity of porous solids and the effects of absolute pressure, temperature, percentage voids and solids composition on this property is presented.

Chapter III is devoted to the transport of mass by flow and by diffusion. In addition to the usual problems of mass transfer from external surfaces of various shapes, the problem of flow of liquids and gases within non-hygroscopic porous solids is treated. Diffusional flow of vapors and capillary flow of liquids in porous solids is treated by conventional methods which have appeared in the literature. Useful data on the resistance to flow of vapors in various types of porous solids are presented in tables of porosity, effective path of vapor flow, termed *wegfaktor*, and a diffusion resistance factor. Methods of measuring capillarity and suction potentials of porous solids are described and a useful tabulation of liquid viscosities and surface tensions for application to capillary flow problems is provided.

Chapter IV, a short section of only ten pages, deals with the important problem of the thermal conductivity of wet materials. This subject has received only slight attention in the theory of drying solids, and this material is a valuable contribution.

Chapter V discusses air drying from the well-known standpoint of the constant-rate and the two falling-rate periods. The usual factors affecting these periods of drying and the critical moisture content are presented in conjunction with numerous plots of drying rate curves for various materials. Selected experimental methods for determining drying rates are described. Data on moisture gradients in various solids are also presented. The latter part of the chapter treats, in less detail, vacuum, contact and high frequency drying.

Chapter VI deals with the effect of external conditions of air velocity, temperature and humidity and radiation on the drying rate from plane surfaces. Both the constant-rate and falling-rate periods are treated, with numerous empirical rate equations proposed. The important problem of material shape and configuration is given cursory treatment in Chapter VII.

Chapter VIII provides examples of making typical calculations of the drying process. A mathematical treatment of heat and mass transfer in the drying of hygroscopic materials is presented in Chapter IX, which involves, essentially, the solution of the partial differential equations for diffusion.

Limited aspects of commercial drying conditions are described in Chapter X, while the final chapter treats briefly the problem of determining moisture in solids and the measurement of humidity.

This book is a valuable reference book for fundamental concepts in the drying of solids. It does not treat freeze drying, superheated vapor and very high temperature drying, nor radiant drying in any detail, and there are serious gaps in literature coverage. It is *not* useful for dryer design calculations, nor for application to process design, nor can it be used to obtain information on dryer selection and performance. It is understood, however, that Volume II is expected to meet these needs. Volume I can be recommended for those scientists and engineers engaged in research and development on drying processes, and as a reference for studies related to the movement of liquids and vapors inside solids.

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Synthetic Ion Exchangers. Recent Developments in Theory and Application. By G. H. OSBORNE, F.R.I.C., Consulting Chemist, Chief Chemist, International Alloys Ltd., and Chief Analyst, The British Drug House, Laboratory Chemicals Group. The Macmillan Co., 60 Fifth Avenue, New York 11, N. Y., 1956. ix + 194 pp. 14.5 × 22 cm. Price, \$6.00.

This volume represents an excellent concise introduction to the subject of ion exchange. It contains a comprehensive bibliography of the rapidly growing literature of this field in its varied aspects. The most noteworthy feature of this book is its lucid introductory chapters on such various phases of ion exchange as resin structure, performance data, ion exclusion, membranes and both analytical and therapeutic