

BOOK REVIEWS

R. B. Keey

DRYING: PRINCIPLES AND PRACTICE*

Reviewed by I. F. Pikus

In 1972, Pergamon Press published the book *Drying: Principles and Practice*, by R. B. Keey, Staff Member of Canterbury University (New Zealand). This monograph is intended for engineers and technicians working on problems of chemical technology and students interested in related fields.

The first chapter provides a brief survey of widely used modern drying methods and ways of supplying heat for dehydrating various moist materials. Problems in calculating the material and energy balance of continuous- and intermittent-operation driers and the I vs d diagram for humid air are also considered in this chapter. The second chapter is concerned with modern concepts of the interaction between hygroscopic materials and moisture in establishing the equilibrium hygrothermal state and a classification of the forms and types of bond between moisture and the material based on a scheme proposed by Academician P. A. Rebinder. Special emphasis is placed on changes in the structural, mechanical, chemical, and biological characteristics of various moist materials during the dehydration process.

The fundamentals of mass and heat transport in the drying of moist materials are presented in chapters 3-6. The chapter "Transport Phenomena" is concerned with the basic concepts of the transport potential and the physical basis of internal mass and heat transport in moist porous solids. It also contains a brief presentation of the classic principles of the heat conductivity of such systems.

The dependence of the thermophysical characteristics of capillary materials on the moisture and the temperature is discussed at length in this chapter. The long fourth chapter, "Heat Transfer," contains basic information on steady-state and unsteady heat conduction in capillary-porous solids of classic form. This chapter discussed the simple case of heat exchange under conditions of forced convection in steady-state turbulent flow around a flat plate and under laminar flow conditions as well as the basic relationships of convective heat exchange for bluff bodies. The concluding part of this chapter presents briefly the problems of radiative heat transfer and the fundamentals of heating moist materials in an electromagnetic field.

Elements of the theory of moisture transport in porous solids are given in chapter 5 of the book. After considering the simplest cases of the mechanism of internal moisture transport in porous systems - isothermic diffusion and effusion transport and isothermic capillary diffusion of a liquid - the author dwells on the important practical problem of the basic relationships of mass transport in thorough dehydration of certain specific capillary-porous colloid materials (food products, wool) under actual conditions of a technological drying process.

Chapter 6 describes the mechanism of evaporation and moisture transfer from the surface of a material to the ambient with a brief presentation of the theory involved in moving the evaporation zone deeper into the interior of a solid. Specialists working on problems of atomization drying will be undoubtedly interested in the data which this chapter provides on the evaporation of individual drops and of an atomized-liquid flow under different sets of operating hydrodynamic conditions of atomization driers.

Quantitative and qualitative analysis of the drying kinetics under constant external conditions and the character of the drying process in intermittent- and continuous-operation devices are considered fairly thoroughly in Chaps. 7-9. A separate section of the chapter "Continuous Drying" is devoted to the operating characteristics of multistage driers and intermittent-drying rotor devices.

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Chapter 10 contains basic information on the different drying methods, such as drying of moist materials in a superheated steam ambience and in vapors of inert solvents, sublimation drying, and vacuum drying under oscillating pressure in the operating chamber.

The most widely used modern methods of determining moisture in materials and drying agents as well as systems for monitoring and controlling the drying process are described in Chap. 11 of the book.

The concluding, twelfth, chapter discusses certain problems of the drying technology. A classification of driers is given along with recommendations on a rational choice of the drier design with reference to the type of dried product, the required capacity, and other technological parameters. Certain aspects of technicoeconomic calculations and estimates of the drying efficiency are discussed.

On the whole, the book, intended primarily for engineers and technicians in the field of chemical technology, is very well written. The author utilizes skillfully the limited space of the monograph, giving a readable, concise presentation of complex problems in drying theory and devoting enough space to the physical meaning of the phenomena and their mathematical description. Without claiming complete or comprehensive treatment of the subject, R. B. Keey refers in almost every chapter to many literature sources, which are for the most part readily accessible, where a broader treatment of individual problems can be found.

It should be mentioned that much of the work of Soviet scientists is reflected in this monograph. In the chapters devoted to the theoretical principles of the drying process, the author availed himself freely of the fundamental work of Academician A. V. Lykov, Academy of Sciences of the Belorussian SSR, including those of his papers that have been published abroad. Among the disadvantages of the book one should perhaps mention the absence of material on the well-known methods of approximate calculation of the drying process duration. Unfortunately, the papers published in the USSR in recent years concerning calculations of the temperature of the material in drying based on the Rb criterion did not come to the author's attention. In our opinion, insufficient space was given to methods for intensifying the drying process and a substantiated choice of the optimum operating parameters.

R. B. Keey's book is of undoubted interest for Soviet readers, as it contains a vast amount of material which reflects to a certain degree the state of the drying theory and technology in Western countries. One should mention that Pergamon Press produced a beautiful edition of this book.