



Collection of E-Books on Drying and Transport Phenomena

edited by Arun S. Mujumdar, Sachin Jangam, and Chung-Lim Law. TPR Group
(www.arunmmujumdar.com).

Vinayak Ghate

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BOOK REVIEW

Collection of E-Books on Drying and Transport Phenomena edited by Arun S. Mujumdar, Sachin Jangam, and Chung-Lim Law. TPR Group (www.arunmmujumdar.com).

For well over 40 years, Prof. Arun Mujumdar has been involved in chemical engineering research. His accomplishments in the field of drying require no introduction. However, Prof. Mujumdar is not only an expert academic but also a benevolent person, having made several of his most important publications available at no charge to the community. The most extensive collection of this online treasure is in the area of drying technology. Additionally, literature can also be found covering other topics in chemical and mechanical engineering. What's more, Prof. Mujumdar has also shared some of his artwork with us. This Book Review covers a number of these freely downloadable e-books on the themes of drying and transport phenomena. I believe that a collective overview of this nature will be of more interest to the readership than a number of individual e-book reviews.

Drying technologies

Drying of Foods, Vegetables and Fruits, Vol. 1 ***(edited by Sachin V. Jangam, Chung Lim Law, and Arun S. Mujumdar)***

Drying of Foods, Vegetable and Fruits is a comprehensive guide for a person interested in the dehydration of food products, and wishes to begin from the basics. The first volume of this treatise discusses the concept of drying, the properties of food materials that influence the drying process, and also provides insights and commentary into the current state of global research and development in drying. It also talks in detail about a traditional drying method—osmotic drying, and a modern one—foam mat drying.

From the first chapter, a beginner can understand the main motivation for dehydrating food—prevention of microbial spoilage. The first chapter also explains to a beginner the basic terminologies that are used in relation to the science of drying, such as water activity and equilibrium moisture content. The second chapter acquaints the reader with some knowledge of food science that is essential to the judicious use of drying as a technology. This includes not just food chemistry in the form of browning reactions and the roles of proteins, enzymes, and vitamins, but also food physics,

with particular focus on the moisture diffusivities and thermal properties of foods. Budding entrepreneurs and industrialists can benefit from the chapter on selecting a dryer to suit an application. In this particular section, dryers are first classified on the basis of the mode of heat transfer to the food. Following this classification, the authors outline different criteria that can be used to select a dryer among different categories, and also a dryer among the same category. An interesting contrast has been provided between novel and classical dryers. A couple of case studies have also been described for further elucidation of the dryer selection process. Another portion that can greatly benefit industrial audience is the section on evaluating product quality post-drying. In this part, methods to analyze the physical, chemical, microbiological, and organoleptic qualities of the food material are described in sufficient detail. This chapter, along with the one dedicated to achieving energy efficiency during drying, will interest academia and industry alike. Academics can additionally benefit from a special segment on elucidating the role of statistical design in food dehydration. The comprehensive description entails the role that statistics can play at different stages of drying research, as well as the various statistical tools that can be used to lend statistical strength to data from drying experiments.

Drying of Foods, Vegetables and Fruits, Vol. 2 ***(edited by Sachin V. Jangam, Chung Lim Law, and Arun S. Mujumdar)***

The second volume of this work shifts focus to a product-specific view of drying. It analyzes the drying requirements of high volume products like roots and rice products. Marine products including fish, which have been traditionally dried all over the world, have also been dealt with in a modern context. The volume especially does well to expand on the dehydration of high-value products, with dedicated sections on exotic fruits, medicinal plants, functional foods, and probiotics.

Exotic fruits are attractive yet challenging materials for dehydration. Hence, this volume does well to open with a chapter on the drying of these high-value

commodities. An admirable variety of fruits has been covered under this category, ranging from stone fruits such as avocado and longan to berry fruits such as dragon fruit and passion fruit. Thus, food processors from all around the world can draw valuable knowledge from this segment. The second chapter in this volume deals with the drying of roots. It covers a number of methods, both classical and modern, that may be used to achieve the dehydration of roots, and also the pretreatment that the roots may require prior to drying. Refreshingly, special attention has been paid to the mathematics of the mass transfer during the root drying process. The chapter ends by describing different methods for evaluating the quality of the dehydrated product. Perspectives have also been provided regarding the directions that research in this area should take in the future. A segment on paddy drying affords particular focus on fluidized bed grain dryers. The application of fluidized bed dryers for the production of parboiled rice has been detailed, as have special applications such as the dehydration of waxy rice. The segment on the drying of medicinal plants will specially interest readers from China and India, where traditional medicinal herbs are gaining more and more prominence. Functional food is a trend that has gripped most developed economies over the past decade. The part on the use of drying in the processing of functional foods offers an opinion on the economic opportunities in the functional foods domain. It goes on to describe the different drying techniques such as spray drying, freeze drying, and microwave drying that can be used for the manufacture of functional foods. The role of drying technologies for the production of probiotics has also been covered in a similar vein. The dehydration of fish and marine products, a traditional activity in many countries, has been discussed in depth in the concluding chapter. In addition to drying, the technique of fish smoking has also been covered. Also detailed are the drying procedures for selected fish products such as the Bombay duck, shrimp, mackerel, and sardines.

Drying of Foods, Vegetables and Fruits, Vol. 3
(edited by Sachin V. Jangam, Chung Lim Law,
and Arun S. Mujumdar)

The third and final volume again delivers a good mixture of conventional and novel drying processes. Extrusion and fluidized bed drying have been discussed in great detail, and so has the process of bread baking, of which drying is an indispensable component. The book opens with a chapter on microwave vacuum freeze-drying, a novel technology to ensure rapid yet delicate drying of high-value fruits and vegetables. Delving

deeper will take the reader to a segment on vacuum frying—an innovative process aimed at preserving the organoleptic and nutritional qualities of fried foods.

Spray Drying Technology (edited by Meng Wai Woo, Wan Ramli Wan Daud, and Arun S. Mujumdar)

Spray Drying Technology dissects the various aspects of the process—mathematical, physical, and chemical. Computational fluid dynamics of the spray drying process are discussed, along with an exclusive section on the modeling of liquid atomization. A simplified one-dimensional procedure for designing a spray dryer has also been explained. Sections on manipulating the physical properties of powders to be spray-dried and in-process crystallization control will help any prospective user of this technology to arrive at a powder of desirable rheology. Chapters on spray freeze drying and the spray drying of food and herbal products provide a commentary on the unique requirements of these processes.

R&D Needs, Challenges and Opportunities for Innovation in Drying Technologies (edited by Sachin V. Jangam and Bhaskar N. Thorat)

It is also worth mentioning that the e-book collection contains a forward-looking book that discusses specifically the opportunities for innovation in drying. This exposition begins with a perspective on the challenges and needs facing the drying industry globally, before discussing opportunities in specific drying technologies such as spray drying and pulsed combustion drying. A picture has also been portrayed of the role of the International Drying Symposium (IDS) in promoting innovation in drying technologies globally.

Coal Dehydration—A Compilation of Relevant Publications and Technical Reports (edited by Sachin V. Jangam and Arun S. Mujumdar)

Works listed on the e-book Web site are not limited to foods. *Coal Dehydration: A Compilation of Relevant Publications and Technical Reports* is indeed an excellent discourse on the state-of-the-art and prospective opportunities in the drying of this important energy source. Reader can find in this book a critique on the drying of low-rank coal and analysis of the patents related to it. A contextual tutorial can also be found for the use of Simprosys, a helpful instructional tool for simplifying calculations in chemical engineering

operations. The book signs off with insights on the potential for innovation in the drying of minerals.

Solar Drying: Fundamentals, Applications and Innovations (edited by C. L. Hii, S. V. Jangam, S. P. Ong, and A. S. Mujumdar)

This work on solar drying begins with an important disquisition about the principles on which solar drying is based and the decision making involved in the selection of a solar dryer. With segments devoted to fruits and vegetables, major commodity products, and fishery products, this book encompasses all the current applications of solar drying while also commenting on future possibilities. Given the growing interest in solar drying, this publication is attracting growing interest with time.

Heat and mass transport

Fluidization Engineering Practice

Outside of drying, books can also be found in the collection on fluidization engineering. The treatise *Fluidization Engineering Practice* covers the diverse applications of the phenomenon of fluidization. The first of these applications is the exploitation of multi-phase flow modeling for nuclear applications. Another application important for the plastics industry, the employment of gas fluidized beds for carrying out the polymerization reaction has also been covered. Readers interested in surface coating technologies can draw upon the knowledge contained in a special chapter on

coating and agglomeration. The use of vibrofluidized beds for crystallization has been covered, and so has combustion in fluidized beds. The production of silicon with the aid of integrated fluidized bed reactors has also been detailed. An important segment deals with gas distribution in fluidized beds, and a chapter has also been dedicated to measurement techniques in gas-solid fluidized beds.

Miscellaneous

Readers seeking a break from technical jargon can find solace in ASmart, a collection of fine water color art by Prof. Mujumdar. The fact that each of the paintings has been accompanied by a relevant inspirational quote makes ASmart not only a relaxing read but also a motivational one.

In summary, Prof. Mujumdar has ensured that a person who desires to learn shall not go without doing so. Such a person will do well to visit <http://www.arunmujumdar.com/e-books.htm>.

Vinayak Ghaté

*PBC Postdoctoral Fellow, Institute of Biochemistry,
Food Science and Nutrition, The Robert H. Smith
Faculty of Food, Agriculture and Environment
The Hebrew University of Jerusalem, Rehovot, Israel*

 vinayak.ghate@mail.huji.ac.il

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