Chapter 1
Introduction

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Consumers prefer food products that are tasty, healthy and convenient. Encapsulation, a process to entrap active agents into particles, is an important way to meet these demands by delivering food ingredients at the right time and place. For example, this technology may allow taste and aroma differentiation, mask bad tasting or bad smelling components, stabilize food ingredients and/or increase their bioavailability. Encapsulation may also be used to immobilize cells or enzymes in the production of food materials or products, as in fermentation or metabolite production.

This book provides a detailed overview of the technologies used in the preparation and characterization of encapsulates for food active ingredients to be used in food products, processing, or production. This book aims to inform people, with both a limited and an advanced knowledge of the field, who work in the academia or R&D of companies on the delivery of food actives via encapsulation and on food processing using immobilized cells or enzymes.

The first part of the book reviews the general encapsulation technologies – food-grade materials and characterization methods for encapsulates.

Chapter 2 by Zuidam and Shimoni introduces the readers to the most common encapsulation technologies and the general criteria to select a proper encapsulation technology for a certain application.

Chapter 3 by Wandrey, Bartkowiak, and Harding discusses food-grade materials to be used for encapsulation.

Chapter 4 by Zhang, Law, and Lian describes the principle behind the methods used to characterize properties of encapsulates, including their applications. Furthermore, the release mechanism of actives from encapsulates are also described.

The second part of the book discusses encapsulates of active ingredients, i.e., aroma, fish oil, minerals, carotenoids, enzymes, peptides, and probiotics, for specific food applications. The group of actives is chosen so that they represent different classes of actives. This part of the book is intended to serve as a guide to a food

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scientist or developer looking for a specific solution to fulfill his or her needs. As encapsulation technologies may change rapidly, emphasis is laid on strategy, assuming that strategy does not change as fast. Most chapters include application possibilities of the encapsulation technologies in specific food products.

Chapter 5, written by Zuidam and Heinrich, highlights aroma or flavor encapsulates. Most of the food encapsulates used are aroma encapsulates. This chapter also discusses how encapsulates could be used to retain aroma during production, storage, and cooking of food products and to release aroma during eating.

Chapter 6, written by Beindorff and Zuidam, discusses fish oil microencapsulates. In this chapter, the authors provide an overview of possible encapsulation technologies used for fish oil and the criteria to select them for different food applications.

Chapter 7 on iron encapsulation is written by Zimmermann and Windhab, and covers the use of encapsulates containing iron and other micronutrients for food fortification of, e.g., salt and staple cereals.

Chapter 8, authored by Ribeiro, Schuchmann, Engel, Walz, and Briviba highlights the use of encapsulates in delivering carotenoids. Carotenoids are instable, natural pigments that are insoluble in water and hardly soluble in oil. Formulation of carotenoids in emulsions or encapsulates influences these characteristics, and improves their bioavailability.

Chapter 9 reviews the encapsulation of enzymes and peptides, including the different types of drying and agglomeration processes. The author, Meesters, also provides examples of their use in industry.

Chapter 10 discusses the encapsulation of probiotics by Manojlović, Nedović, Kailasapathy, and Zuidam. These living and large actives need to survive the food process, storage, and food intake before they can be useful. Examples of the use of encapsulated probiotics in food products are provided.

The last part of the book describes immobilization technologies of cells or enzymes for use in food processing and production.

Chapter 11, authored by Verbelen, Nedović, Manojlović, Delvaux, Laskošek-Čukalović, Bugarski, and Willaert, shows how immobilization of yeast cells can be used in the fermentation of beer.

Chapter 12 reviews how encapsulation of microbial cells can be used for alcoholic and malolactic fermentation of wine and cider. It is written by Kourkoutas, Manojlović, and Nedović.

Chapter 13 by Champagne, Lee, and Saucier describes how immobilization of cells and enzymes can be utilized in dairy and meat fermentation processes.

Chapter 14 presents the view of Breguet, Vojinovic, and Marison on the use of encapsulates for food bioconversions and metabolite production.

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We hope you will enjoy reading this book and that it may help you in choosing the right encapsulation solution to fulfill your need!