

BOOK REVIEW

Mechanism and Theory in Food Chemistry (2nd edition)

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Dominic Wong has a history of very useful books, and his 2nd edition of the *Mechanism and Theory in Food Chemistry* is almost easy to read and understand, even by readers unfamiliar with the subject. Across ten chapters the author tackles many theories and mechanisms of action from various angles to make them interesting and useful to different scientific disciplines, such as organic chemistry, biochemistry, medicine, and occupational, food, and environmental toxicology.

The Lipids chapter explains in very clear terms the electronic structure of lipids and chemical and other factors for auto-oxidation and lipid oxidation, such as photosensitised oxidation and radiolysis of lipids and thermal oxidation. It also gives us a wider picture of lipids as emulsifiers and of their role in the stabilisation and thermodynamics of emulsions on the molecular level, including Van der Waals forces, electrostatic repulsion of emulsified particles, and factors contributing to emulsion instability such as coalescence, flocculation, and sedimentation. Readers get the basics of processes applied in pharmaceutical, cosmetics, and other industries in which emulsions are important. The chapter concludes with an overview of antioxidants and how they protect lipids in food products from autooxidation.

The Proteins chapter describes the structure of proteins and how it determines their reaction with the products of lipid oxidation. One section is dedicated to protein systems such as meat, milk, wheat, soybean, and collagen and their water-holding capacity. Especially important is the structural organisation and biochemical properties of muscle fibres, which is the starting point in studying the quality of food or its behaviour in different conditions of meat processing and storage. In addition, through four detailed biochemical reactions, we learn about the conversion of chemical into mechanical energy, which gives an insight into various influences of drugs and other internal and external harmful substances on *rigor mortis*.

The Carbohydrates chapter looks into the formation of anhydrous sugar and furan derivatives and points out that the Maillard reaction (non-enzymatic browning) and secondary reactions are among “the most important reactions [...] in food...”, as they reduce the nutritional quality and may generate toxic and mutagenic compounds. The chapter proceeds with the formation of sugar, metal ion complexes, and hydrocolloids used for gelling and lowering the caloric value of carbohydrates. In addition, the author gives us a review of interactions with proteins,

carrageenan, and its synergistic effects with locust bean gum in particular.

The Colorants chapter opens with the physical and chemical basics of colourimetry and absorption of light, which is very important for understanding colouration of plants and animal meat and chemical reactions taking place during thermal or non-thermal food processing. Special attention is given to metalloporphyrins, myoglobin in particular, as physiological food constituents.

The Flavours chapter discusses the mechanisms and physiological and anatomical origin of taste and odour, and the role of umami. We find this chapter very useful for scientists from non-medical fields, as it explains the stereochemical theory of olfaction, molecular mechanisms of odour recognition, and the influence of taste enhancers. There is also a very interesting section about technological solutions of microencapsulation of flavours.

The Sweeteners chapter introduces the reader to the tripartite theory of sweetness and sweet taste receptors and then moves on to amino acids and dipeptides (aspartame and neotame), amino sulphonates, dihydrochalcone, stevioside, sugar alcohol, corn sweeteners, and sweet proteins important for the aethiopathology and management of diabetes mellitus.

The Natural Toxicants chapter looks into cyanogenic glycosides, glycoalkaloids, glucosinolates, and methylxanthines, their metabolism and toxicity. Particular attention is given to amino acids, peptides, and proteins participating in food poisoning such as the botulinum toxin, mycotoxins, polycyclic aromatic hydrocarbons, and heterocyclic amines. The chapter ends with nitrosamines, whose toxicity, mutagenicity, and carcinogenicity are of great concern for human physiology and health.

The Vitamins chapter gives a review of the most important vitamins (A–E), their chemical structure, biological functions, and biochemical reactions such as those between thiamine and bisulphite, photolytic degradation of vitamin B12, vitamin D reaction to irradiation, or vitamin E quenching of singlet oxygen.

Even though each group of compounds is described clearly and in detail at the beginning of each chapter, the author also provides supplementary information about chemical reactions in food involving olefin auto-oxidation (Appendix 1), singlet oxygen (Appendix 2), free radicals (Appendix 3), and flavonoids (Appendix 4) through figures and tables.

We find this book very useful for medical students and all who wish to renew their knowledge of food chemistry. The author mostly uses common names, which may ease understanding to lay readers in the US but not as much to international audience who mostly rely on standard nomenclature. Perhaps the next edition will address this minor limitation.

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