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Book reviews

A. Ramamoorthy (Ed.), NMR spectroscopy of biological solids, CRC Press, Boca Raton, FL, USA, 2006, (vii+353 pp, £63.99, ISBN: 1-57444-496-4).

Solid-state nuclear magnetic resonance (SS-NMR) spectroscopy is an important technique developed in the last decade, which can be used for several applications in a range of scientific fields, such as analytical chemistry, bioengineering, materials science, and structural genomics. The aim of this volume is to detail information on recent developments in the field of SS-NMR and its application to biological systems for investigation of the structure and function of biomolecules. It focuses on how results elucidate chemical bonding, molecular shape and geometry, local and global molecular dynamics, folding, and intermolecular interactions.

Magic-angle spinning (MAS) recoupling techniques were originally designed to examine individual dipolar interactions between spin pairs to yield a few high-precision distances between site-specifically labelled nuclei. However, MAS-NMR techniques for measuring many semi-quantitative distances in multidimensional spectra are now playing a prominent role in the total structure determination of solid proteins, membranes, membrane proteins, protein complexes, and fibres (Chapters 1 and 2). General strategies and methodologies for resonance assignments and the determination of secondary and tertiary structures (protein interfaces, side-chains and backbone correlations) by multidimensional MAS techniques, specifically illustrated by using *E. coli* thioredoxin as an example, are discussed (Chapter 3). Others parameters such as torsion angles are important in the analysis of peptides and proteins, and therefore several SS techniques are presented to measure molecular torsion angles including static tensor correlation and dipolar recoupling methods (Chapter 4). The use of double-quantum SS-NMR spectroscopy for studying peptides and proteins at materials interfaces, such as on inorganic crystals, hydrophobic polymer surfaces and attached to monolayer-protected gold nanoparticles is also presented (Chapter 5).

Many of these techniques are not so suitable for the study of biological complexes such as membrane and amorphous materials because of their time instability and require a higher sensitivity not found in SS-NMR. Therefore, in the next Chapter (6), several techniques (namely cross-polarisation MAS, and REDOR-based techniques) based on proton-detection which have a less constraining relating sensitivity, are discussed, in addition to their biomolecular applications. Membrane proteins are such important targets for structure determination by NMR spectroscopy that modelled bicelles systems and numerical simulations are required in order to understand the dynamics and diffusions in such macromolecular structures (Chapter 7). Recent developments and methodologies for membrane protein structure determination in oriented planar lipid bilayer samples is overviewed with specific illustration of studies on the FXYD proteins (Chapter 8). As a result of their physicochemical properties/characteristics, the study of biomembrane peptides and proteins is very complex, and requires deployment of suitable methods based on their diffusion, function, conformation and structure. The use of SS ^{19}F NMR spectroscopy for the analysis of membrane-active peptides, and the use of SS-NMR techniques for the study of magnetically aligned phospholipid bilayers (bicelles), are presented in Chapters 9 and 10, respectively.

All of the cited SS-NMR techniques have to be associated with powerful simulation software programs (such as SIMMOL, HORROR or DREAM), that allow three-dimensional visualisations or parameter calculation of tensorial interactions of spin systems (Chapter 11). Theoretical (computational) and experimental studies on the effect of conformation on the chemical shielding of ^{31}P in the phosphodiester linkage and ^{13}C in the ribose/deoxyribose moieties of nucleic acids using MAS techniques are presented in the penultimate Chapter (12). The final chapter covers the application of SS-NMR techniques to alkali metal ions in biological systems and to the characterisation of ion coordination environments in a special four-stranded DNA structure (known as the G-quadruplex) by describing current approaches based on ^{23}Na and ^{39}K SS-NMR techniques.

In conclusion, the purpose of this informative volume is to provide a detailed understanding of SS-NMR techniques relating to solid biological systems, by addressing principles, methods, and applications, and specifically providing a critical selection of methods for solving a wide range of practical problems that arise in both academic and industrial research of biomolecules in the solid state. It is therefore highly recommended to all individuals with interests in this rapidly expanding and extremely interesting area.

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P. Belton (Ed.), The Chemical Physics of Food, Blackwell Publishing Ltd., Oxford, UK, 2007 (ix+247 pp., £105.00, ISBN: 1-4051-2127-9).

Because food materials are complex, it is difficult to describe them in a quantitive manner. *The Chemical Physics of Food* shows that it is possible to deal with this aspect in a chemical physics approach. However, the Editor, Prof. Peter Belton, in the School of Chemical Sciences and Pharmacy at the University of East Anglia, UK, has gathered an international team of authors who exemplify, each one in their speciality, the up-to-date rigorous

methods of describing food with quantitative consideration of data.

Emulsions exist in a lot of foods like ice cream and mayonnaise, hence the introductory chapter (Chapter 1) gives a description of them and keys to understand them. Starch is by far the most consumed polysaccharide in the human diet. Traditional staple foods such as cereals, roots and tubers are the main source of dietary starch. The composition and chemical structure of starch, and their transformations are described with a range of kinetic and thermodynamic factors (Chapter 2). Processing response, storage stability and organoleptic properties are controlled by water. It is the reason why water transport and dynamics in food require a good knowledge but involve a wide range of distance and time scales (Chapter 3). It is possible to model this water transport on the microscopic and distance scales. With increasing computer power it is hoped that current empirical approaches will be replaced by rational prediction.

The glassy state is surprisingly but commonly used in food to preserve it. However, this is often done unwittingly but is an underlying principle which is clearly explained in this book (Chapter 4). Powders and granular materials represent a big part of the food products transported worldwide; obviously it is important to avoid the unnecessary transport of water. The definition of powders and granules is broad, and therefore many aspects need to be considered to assess their properties (Chapter 5). Indeed, they need to be shelf stable and convenient in use, but since the properties of these compounds are complex their chemistry and biological influences are not fully understood.

Gels are apparently solid, jelly-like materials formed from colloidal solutions based on proteins and macromolecular carbohydrates. Using a range of specific examples, emphasis is placed in this chapter on the new and emerging concepts of what gels can do for the food industry (Chapter 6). Wheat-flour dough rheology is given a specialist treatment in the final chapter and illustrates the comprehensive advances that have been made in modelling this phenomenon and points to future possibilities in food textures.

This book, well documented (bibliographical references for each food topic), shows the important insufficiency in modelling food from a physicochemical point of view. It explains theoretical aspects to consider and shows some practical examples to deal with that matter. It covers all major types of materials that are dealt with by food scientists and technologists.

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