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Carbohydrate Polymers 55 (2004) 333
Carbohydrate Polymers
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Book Review

Magnetic resonance in food science (latest developments) P.S. Belton, A.M. Gil, G.A. Webb, D. Rutledge (Eds.); Royal Society Chemistry, Cambridge, 2003, x + 272 pages, ISBN 0-85404-886-3 (£89.50)

The molecular complexity of food is an inherent characteristic that should be investigated quickly and correctly from the beginning to the end of the human food supply chain (raw materials, manufacture, storage/distribution, eating and digestion/metabolism) to produce and design modern food products to satisfy consumers' demands. Molecular behaviours of food components can be probed by various methods including NMR, so that various chemical, physical and biological properties of foods can be explored. At present, food scientists have enjoyed the benefits from NMR both from quality control to sophisticated applications such as the investigation of bulk structuring systems in foods (carbohydrates, oils, proteins). Recently, it has been used to define molecular structure within complex matrices and determine oil and fat content as well as oxidative changes. In order to collect the latest information and developments in magnetic resonance techniques and their application in food areas, The International Conferences on Applications of Magnetic Resonance in Food Science was held by The Institute National Agronomique Paris-Grignon (INA-PG), which resulted in this publication.

NMR has an important scientific role to play and is applied for the analysis of the breadth and depth of food characterisation information. It has also been applied in quality control to determine the characteristics of products, such as authentication, detection of adulteration and analysis of some on line product characteristics such as rheology, bacteria spoilage, etc. The term magnetic resonance also covers a wide range of techniques, including spectroscopy, relaxation and imaging. Measurements of relaxation times are particularly suitable as a probe of water and oil micro-environments within the multi-compartment structure characteristics of the raw materials and foods. While imaging methods are applied increasingly for the non-invasive visualisation of both natural materials and assembled foods, with the information content growing as hardware and image contrast methods improve. Application of NMR covers a wide range in foods and is adapted for use with many tools such as Magnetic Resonance Imaging (MRI) and micro-MRI, etc. which has benefits in areas of structural chemistry, molecular reaction and interaction, mobility, tempering microbial activities, etc. In addition, electron spin resonance (ESR) spectroscopy is evolving and leading to various new applications in food science and nutrition. It is also known as electron paramagnetic resonance (EPR) spectroscopy, which can be employed to investigate the free radical processes and paramagnetic resonance metals in chemical and biological systems during some very complex oxido-reduction reactions. For example, using the spin trap (i.e. nitroso or nitrone compounds) to convert reactive free radicals to stable nitroxide radicals (adducts) with spectral hyperfine splittings that reflect the nature and structure of these radicals. By the direct relation of intensity of free radical formation from the measured ESR spectroscopy signal, the concentration of spin adducts can be interpreted, while the height of the spectral peaks are proportional to the number of radical adduct molecules in the accumulating system. It can be used to investigate and study the antioxidative ability of some herbs and spices too.

This volume is divided into sections or parts which provide an understanding of the development of Magnetic Resonance techniques in food areas; Magnetic Resonance Scene, The human aspect (for this technique), Using this technique for Food Structure and Dynamics, and finally for Food Quality Control. It is of interest to academics and industrialists in food science due to it being the latest series in this fast moving food science area.

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0144-8617/$ - see front matter © 2004 Published by Elsevier Ltd.
doi:10.1016/j.carbpol.2003.10.007