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Book reviews

Gums and Stabilisers for the Food Industry 13, Peter A. Williams, Glyn O. Philips (Eds.). The Royal Society of Chemistry, Cambridge, UK (2006). xiii+495, £99-95, ISBN: 0-85404-673-7

Polysaccharides are widespread in nature; many of them are currently used as potential emulsion stabilisers, water holding agents, thickeners or gelling agents. Polysaccharide hydrocolloids are obtained from plant sources, seaweeds, animals or microorganisms. Hydrocolloids are commonly used in foods as they can control rheology and texture, prevent sedimentation and creaming, inhibit ice crystal growth or control the organoleptic properties. Polysaccharides may be homo- or heteropolymers consisting of either the same or different sugar units. They may be linear or branched, some are soluble in hot or cold water and some require other solvents. All of these features affect the functional properties of the hydrocolloids in foods. The 13th volume of 'Gums and Stabilisers for the Food Industry' provides essential current information knowledge about polysaccharides being crucial substrates in the food industry.

All plants have primary and secondary cell walls, which are composed of polysaccharides, namely insoluble cellulose, hemicellulose, pectin and lignin. Knowledge of the major components of a cell wall is important for understanding the functional properties of many plant products particularly food and fibre. Therefore monoclonal antibodies are key tools for the analysis of complex cell wall polysaccharides. The ideal target for anti-polysaccharide antibody is an epitope, which is a known structural feature of three to five sugars (included in the volume section covering Biochemical, Chemical and Physicochemical Characterisation).

One of the most used carbohydrates in the food industry as a thickener, stabiliser and binder is starch. During heating in water it swells and amylose is released into the solution, resulting in a viscosity increase and gelatinisation. Together with several factors such as temperature, the botanical source of starch, and the addition of other ingredients like a sugar, the swelling and gelatinisation of starch may be controlled for the purpose of improving food properties, which is one of the subjects covered in the volume part devoted to Engineering Microstructure.

Proteins may form stabilising structures at oil–water and air–water interfaces in food emulsions and foams. Moreover, they are complex surface-active polyelectrolytes and build layers which play a major role in controlling the texture, mouthfeel and shelf-life of products such as mayonnaise, coffee creamers, cream liqueurs, ice-cream and whipped desserts. Their stability in these products depends on others molecules. Under certain conditions proteins may be displaced from oil–water or air–water interfaces by some emulsifiers which presents new technological ways for the food industry (covered in the volume part on Emulsions and Foams).

The remaining part of the volume is devoted to specific aspects of the food industry, in which hydrocolloids have numerous applications e.g. in dairy, spreads, savoury and meat products, frozen food and beverages. For example in beverages they may stabilise a pulp, modify a flavour profile, enhance a mouthfeel, fortify the dietary fibre or encapsulate a micronutrient. Additionally, being emulsions they may disperse poorly soluble flavour oils in water and provide a cloudy appearance to mimic the appeal of a natural fruit juice.

Another issue that is concerned with gums and stabilisers is their organoleptic properties. During oral processing food emulsions undergo a series of processes in the mouth. First they are heated or cooled to body temperature, mixed with saliva (which contains enzymes, salts and various biopolymers) and sheared between tongue and palate. In this process polysaccharides play a very important role as a thickener and specific materials as fat replacers and this is widely discussed in the volume part on Organoleptic Aspects.

Finally an overview of hydrocolloids is presented which are important for health improvement. One of them, dietary fibre is the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Their physiological effects such as effect on gastric emptying and satiety or influence on the lipid metabolism are presented in the part named Hydrocolloids for Health.

To conclude, this volume discusses new ideas and new technologies in research and development, which will improve the properties of gums and stabilisers utilised in food production. Additionally control of structure and influence on functionality of hydrocolloids in food is a very important issue undertaken in this book. This book is a fresh glance on food quality and should be helpful not only for people working in the food industry but also as a useful handbook for students.

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Natural Fibers, Biopolymers, and Biocomposites, Amar K Mohanty, Manjusri Misra, Lawrence T. Drzal (Eds.). CRC Press, Taylor & Francis Group, Boca Raton, FL, USA (2005). xii+896 pp, £85.00, ISBN: 0-8493-1741-X

Nowadays, words such as biopolymers, biocomposites or natural fibres have lost all their mysterious character and have became well known and extremely valuable not only in the scientific world. Because of their biodegradability and renewable properties, biomaterials are excellent alternative feedstock sources in such areas as marine, electronic components, aerospace, automotives, various appliances, etc. Over the last 30 years a number of different biobased products have arisen with great impetus, among them, e.g. polylactic acid from corn, polyurethane products from soy oil, soy protein adhesives, lubricants from vegetable oils, polyhydroxyalkanoates or biocomposites from lignocellulosic fibres combined with petroleum-based polymers like polypropylene (PP) and polyethylene (PE).

The area of natural fibers, biopolymers and biocomposites has become very wide and this volume aims to illustrate a large number of substantial topics. Natural fibers, biopolymers and biocomposites very often come from plants. Plant fibre crops belong to the earliest known cultivated plants and they used to possess great agricultural application in textile production. Green composites made from plant fibres offer a valid alternative to the commonly used synthetic reinforcing fibres like glass or aramid (Chapter 2). To obtain an optimal fibre length (e.g. from bast fibre plants) for processing of composites, special fibre cleaning and the use of unique fibre-cutting machines is involved (Chapter 3). The retting significantly influences fibre quality and depends on weather conditions; hence it may change from year to year (Chapter 4). The low-cost materials that may have potential as wood fibre alternatives are considered for use in melt-blend biocomposites (Chapter 5). Moreover, the use of biofriendly fibre-reinforced plastic composites is desirable in automotive (Chapter 7) and building (Chapter 8) industries.

In the world of biomaterials one meets different types of resins such as unsaturated polyesters or vinyl esters. Glass fibres may consist of polyester resin reinforced composite materials, which are used to build various yachts or workboats (Chapter 9). A great raw material for biofibres production is wood. The different species of wood and their compositional differences dictate the properties and quality of the final product (Chapter 10). The first attempt to use bamboo-biodegradable polymer composites in injection molding reveals that tensile and flexural modules increase with increasing bamboo content (Chapter 11). Numerous applications of oil palm-fibre, natural fibre as rubber composites or straw-based biomass and biocomposites are thoroughly introduced appropriately in Chapters 12, 13 and 14. The new arising polymer platform – Sorona® has been recently introduced by the DuPont Company. This polymer can be shaped into fibres and others articles to offer a unique combination of softness, comfort-stretch and recovery, dyeability, and stain resistance (Chapter 15). Poly-lactic acid and lactide (PLA) can be also useful in fabrication of films and fibres (Chapter 16). PLA biocomposites containing inorganic fillers or reinforcements and PLA biocomposites reinforced with natural fibres are discussed in Chapter 17. The following parts of the volume disclose the relevant information concerned with bacterial polyester-based biocomposites, fibre-reinforced cellulose esters and cellulose-based nanocomposites, starch polymer blends and biocomposites. The new polymers from soybeans not only possess industrially viable thermophysical and mechanical properties, but also unique good damping and shape memory (Chapter 24). Other biobased polymers and their composites, namely polyurethanes, are produced by combination of petroleum-based isocyanate reactants with polyols derived from resources such as lignin or wood (Chapter 25).

"How sustainable are biopolymers and biobased products?" This question is given as a title in the last chapter, but the answers we can find in all particular subjects, which have fulfilled the book. First of all – biobased polymers are friendly for the natural environment; therefore they very often compliment other feedstocks and significantly support industrial ecology.

This volume is of great value both for specialists in biobased materials industries, because it includes up to date information on a wide variety of biobased materials and their property comparison; and for scientists, academics, students and civil servants. A lot of actual data is presented in tables, diagrams, schemes and pictures, which facilitates the readers' deep understanding of the presented subjects.

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