

Advances in Polymer Science Vol. 64: Polymer Membranes

M. Gordon (Ed.)

Springer Verlag (Heidelberg),

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This volume of the series comprises three review articles on selected areas of membrane science.

The first and longest article, 'Polymeric monolayers and liposomes as models for biomembranes' (H. Bader, K. Dorn, B. Hupfer and H. Ringsdorf), is an absorbing account of the progress made in providing realistic models for biomembranes. Monolayers, bimolecular lipid films and especially liposomes prepared by polymerization of the monomeric lipid structures are discussed at some length. The remainder of the article is devoted largely to ways of modelling typical biological behaviour such as surface recognition and enzymatic activity through the introduction of natural lipids and proteins into a synthetic system or of synthetic components into a natural cell membrane.

There follows a review, 'Polyamides as barrier materials' (H. Sumitomo and K. Hashimoto), of the various polyamide materials that have been considered for membrane applications, largely in the field of reverse osmosis. There is a short account of desired membrane properties and the importance of factors such as hydrophilic-hydrophobic content of the membrane and uniformity in the distribution of the sorbed water in determining the flux and solute rejection. The numerous polyamide related materials that have been tested are then discussed with indications of their water flux and salt rejection performance.

The final article, 'Membranes with non-homogeneous sorption and transport properties' (J. H. Petropoulos), deals largely with theoretical aspects of the transport of gases in glassy polymers and in composite structures. A concise account of dual mode transport theory and its more recent applications is followed by reviews of gas transport in heterogeneous polymeric media such as polymer blends and graft copolymers that exhibit distinct domain structures and laminated or graded structures in which the transport properties vary across the membrane. Developments in permeation time-lag and transient diffusion analysis

when the solubility and diffusion coefficients are functions of the space coordinate are illustrated with respect to microporous membranes formed by compression of fine powders. Although the emphasis is on gas transport, the application of dual mode theory to ionic transport in membranes is also considered as well as the effect on ionic transport of non-uniform distribution of electric charge in charged membranes.

The articles are authoritative accounts of the selected subject areas and will be of interest to membrane scientists.

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Plastics Additives Handbook – Stabilizers, Processing Aids, Fillers, Reinforcements, Colorants for Thermoplastics

R. Gächter and H. Müller (Eds)

Carl Hanser Verlag (München)

1985, xxiv + 754 pages,

DM148 (approx. US \$58, £44)

ISBN 3-446-13662-2

It is more than a decade since Mascia's monograph appeared on this subject. The area has developed extensively in the intervening period, and has prompted some specialist reviews and compilations such as Henman's 'World Index of Polyolefin Stabilizers'. However, no major, comprehensive English-language contribution to the literature has been forthcoming. The 'Taschenbuch der Kunststoff-Additiv' (in German), meanwhile, has appeared in two editions. The publishers have taken advantage of the resultant opportunity, by now producing this translation and revision of the second edition. The editors state that the English text corresponds very closely with the latest German edition, except for minor changes and linguistic adaptations.

The resultant Handbook is an admirable review of the state-of-the-art achieved in additives for plastics. It would seem a useful starting point and reference

work for all those in industry, or in applied science research groups, concerned with the technology of plastics, particularly those involved in thermoplastics compounding and compound development. Lecturers in, and students of, polymer science and technology would do well to read it at an appropriate depth to get a current overview of this developing field.

Its scope is limited to thermoplastic polymers, but the term additives has been interpreted in its broadest sense. Thus, fillers and reinforcements are covered. This is in accord with the current connotation of 'additives'.

By virtue of the comprehensive nature of the task, the result is a lengthy book. It is, however, presented in a convenient practical format, by virtue of its physical dimensions, and the flexible vinyl-laminated cover. This makes a compact volume, justifying adequately the title Handbook. Its appearance is by no means formidable, and might even be described as deceptive, when the breadth of coverage is considered.

The editors have approached this subject, difficult because of its diversity and continuing rapid development, by engaging over twenty authors from Continental European industry. The first seventeen chapters are each devoted to an individual additive class. These are:

- Antioxidants
- Metal deactivators
- Light stabilizers
- PVC stabilizers
- Plasticizers
- Lubricants and related auxiliaries
- High-polymeric processing aids for PVC
- High-polymeric additives as impact modifiers
- Fillers and reinforcements
- Colorants
- Flame retardants
- Antistatic agents
- Fluorescent whitening agents
- Biostabilizers
- Chemical blowing agents
- Organic peroxides as cross-linking agents
- Nucleating agents

Each of these chapters is structured essentially along the same lines, commencing with an introductory technical-commercial outline, followed by a synopsis of the appropriate fundamental science. The subsequent main part deals with the additives and their use in individual thermoplastics. In many chapters the commercial products

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are conveniently tabulated. A final section in each chapter attempts an outlook on the future. The reference sections given at the end of each chapter vary considerably. Some are superficial, whereas others direct one to German or European literature that might otherwise pass undetected. Some include useful details of the appropriate patent literature.

Chapter 18 is devoted entirely to 'Health and Safety' aspects of additives, both in incorporation and product use.

The final Chapter 'Compound Development and Compounding of Thermoplastics' has a rather misleading title, and is rather disappointing. It is almost exclusively related to PVC compound development and compounding. The special requirements for the compounding of performance polymers, with engineering or exacting technical applications, are not even mentioned.

The detailed Contents section of this book, which is perhaps unusually long at nineteen pages, together with a twelve page index, facilitate the rapid location of a particular aspect of the subject.

With this volume having the nature of a review, its continuing value will be related to how well it is kept up-to-date. This will hopefully be achieved by further translations of subsequent German editions.

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Water-Soluble Polymers: Developments since 1978

Yale L. Meltzer

Noyes Data Corporation (New Jersey, USA), US \$54,
ISBN 0-815-0834-4

The title of this book is somewhat misleading; it is not a critical assessment of developments since 1978. It consists of synopses of US patents issued since January 1979 through 1980 dealing with applications for water-soluble polymers. The extent of innovation in this field can be gauged from the large number of patents that have been abstracted (306). There are sections that deal with 23 different chemical types of polymers, some synthetic and others natural or their derivatives, such as gelatine, natural gums and cellulose and others. So it can be appreciated that the processes and materials dealt with range very widely. The common theme is that the polymers are water soluble.

The treatment of each polymer type is dealt with in two sections: processing and applications. For example the section on carboxylic products lists two patents under the heading of processing, one dealing with the preparation of phosphorus-containing carboxylic polymers, which are used to inhibit scale formation in aqueous systems, and the other with the manufacture of aqueous metal working fluids containing carboxylic acid group terminated diesters of poly(oxyalkylene diols). In the larger section, 10 applications of carboxylic products are considered, which range from glass-ionomer dental cements to

detergent compositions comprising polyacetal carboxylates.

Thus the usefulness of this volume is to alert the reader to potential applications of specific polymers. It is the sort of book that provides ideas for solutions to existing problems or novel routes to new products. However, there are not any references to basic studies. For instance, there are abstracts of two of the patents on glass-ionomer dental cements, which carry the names of A. D. Wilson and S. Crip, but the many scientific papers by Wilson and his co-workers are not noted. This deficiency is important because just a reading of the patent abstracts would not lead the uninitiated to an appreciation of the very large amount of research already done in this area. Of course it is not possible from a survey of patents to obtain any information on the 'take-up' or utilization of a process or material. The glass-ionomer dental cements are widely used in the UK and further research is continuing to effect better performance.

Unfortunately a detailed discussion of any particular topic from this book is bound to be selective but the general point holds that surveys of patent literature can be useful but require other input information to be used effectively. The author lists '16 reasons why US Patent Office Literature is important to you'. The last two are: 'It is a creative source of ideas for those with imagination', and 'scrutiny of the patent literature has important profit-making potential'.

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