

# book reviews

## Polymer Colloids

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The coverage of this book may not be immediately apparent from its rather terse title. Essentially, it deals with aspects (mainly fundamental) of lyophobic colloidal systems in which polymers (mainly synthetic) form the disperse phase. There is a different authorship for each of the eight chapters. Considerations of preparation and stability should, of course, provide the groundwork upon which the edifice of the whole topic stands conceptually. These do, in fact, provide the themes of Chapters 1 and 5.

The first chapter is an overview of the multiplicity of methods available for preparing fine polymer dispersions in media ranging from those of high dielectric constant such as water to the other extreme typified by liquid inert gases. Many of the procedures have been drawn from the patent literature and hence may be unfamiliar to the general reader. The section ends with an excellent Appendix in which the most important features of the methods are summarized in an extended table. The longest section, which forms about a quarter of the whole book, is Chapter 5 'Stability of Polymer Latices'. Here Buscall and Ottewill consider the origin of basic interparticle forces in attempting to elucidate the stability behaviour of dispersions in both aqueous and non-aqueous media. The effects are taken separately as electrostatic and steric. Although the introductory, schematic potential energy diagrams are well documented elsewhere, the detailed treatment on the effect of soluble polymers is extremely well presented. In particular, by concentrating on conclusions rather than derivations, the authors have succeeded in rendering much of the mathematical complexity on steric stabilization more accessible to the experimentalist. There is one minor, but perplexing point, *viz.* with the ready availability of the English and Greek alphabets, why was it necessary to concoct a highly bizarre new symbol to denote lattice coordination number in a polymer solution? (p. 182). Moreover, in two simple forms of segment-density distributions (p. 184) this same symbol is used to denote the distance normal to the surface. Is this the same as the coordination number? If not, perhaps it

would have been as well to distinguish it by another symbol. These trivia apart, this chapter is a most welcome and up-to-date review.

Adsorption from solution is split into two sections wherein the adsorbates are low molecular weight ionic species (Chapter 3) and macromolecules (Chapter 4). The former deals with latices, the surfaces of which contain bound or adsorbed ions and molecules that may contain ionizable functional groups. The various theoretical models are set out clearly and then applied to actual systems. There is also a short review of the electrochemical techniques for evaluating adsorption and desorption of ions at the latex-water interface. More recent techniques such as laser Doppler spectroscopy are only mentioned, without any amplification. As pointed out by Tadros in his introduction to Chapter 4, in contrast to the situation prevailing in Chapter 3, a successful theory of polymer adsorption has to be intimately concerned with details of intramolecular arrangements near the interface as well as the way in which these are perturbed by environmental factors. This chapter commences with theoretical predictions mainly due to the work of Scheutjens and Fleer. The author then compares these with experimental findings insofar as the limited availability of reliable data allows. Finally, experimental methods are described for measuring the crucial quantities segment-density distribution (*cf.* Chapter 5), adsorbed layer thickness, fraction of bound segments and amount of adsorption/area. To compound the complexity of the problem it is necessary also to know how each of these changes with concentration and chain length of polymer and the polymer-solvent interaction. The mode of measuring each of these is indicated.

In Chapter 2 Poehlein summarizes 'Mechanisms and Kinetics of Emulsion Polymerization'. Despite the existence of related reviews, this is a useful semi-quantitative presentation of the topics within the Chapter heading as well as reactor design and operation. 'Rheology of Polymer Colloids' (Chapter 2) is a subject dealt with in primary publications but less commonly in reviews. This section affords a good step-wise introduction to fundamental concepts in viscosity, both Newtonian and, more relevantly to concentrated polymer dispersions, non-Newtonian. An attractive feature is the demonstration of dimensional analysis to reduce the number of variables in the rheological equation for rigid sphere dispersions.

The final two Chapters are of a more applied nature. Chapter 7 on 'Natural and Synthetic Rubber Latices' is provided by D. C. Blackley, already known for his authoritative work in this field as well as for his much earlier two-volume treatise on latices. Of the six subdivisions the major ones are devoted to natural rubber latex, synthetic rubber latices and stabilization of colloidal latices (including a section on controlled destabilization, which can be important during processing). This is an eminently readable and informative review written without the inclusion of a single mathematical symbol or equation. Similar comments apply to the final section (Chapter 8) in which D. G. Rance describes the considerable complications inherent within 'Colloidal Aspects of PVC Production Processes'.

A book with the same title was brought out by a different publisher in 1980 and the subject is clearly of continuing industrial and academic significance. Regrettably, the author of Chapter 1 of the present book (M. Thomson) passed away during the preparation of the book and rewriting and revision of his draft were undertaken by the editors. For this reason and for their most apposite selection of eminent authors the editors are to be congratulated. The end-product is a most useful and up to date treatise, which is substantially, but not entirely, free from minor errors. Consequently, it might appear churlish to level any form of criticism. However, attention is drawn to the following points. (a) The index is inadequate. (b) The excellent subdivisions of the chapters are tabulated neither at the start of each chapter nor at the beginning of the book. (c) Although they are all defined at their first appearance, there is an enormous number of abbreviations in the text (for example CSTR, CGSG, CFC, UCST, etc.). It would assist the reader if all these and their meanings were collected and tabulated at the end of the book. (d) Some degree of overlap is inevitable, but the time-honoured (and therefore doubtless true) steps in free radical addition polymerization are set out in the beginnings of *two successive* chapters (1 and 2).

The current UK price is a realistic one of £38, but it remains to be seen whether this can be stabilized as strongly as the colloidal dispersions!

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