

## The Vibrational Spectroscopy of Polymers

D. I. Bower and W. F. Maddams (Eds)

Cambridge University Press,  
Cambridge, 1990, 326 pages,  
£50.00  
ISBN 0-521-24633-4

This book is the latest to appear in Cambridge University Press's Solid State Science series of monographs and hence joins books on interfaces, fracture microstructure and morphology in ceramics, metals and polymers. As such, it is a most valuable addition. The authors clearly state that their intention is to provide an instructional volume aimed to give graduates in physics, chemistry or materials science a sound grasp of the fundamentals behind molecular vibrational studies on polymers. They do not attempt to review this vast subject but have confined themselves to laying out in an easily digestible form how spectra are recorded and then analysed. They give an account of the use of symmetry in relating polymer structure to vibrational properties and go on to discuss the relationship between molecular vibrational frequencies and force fields. To encourage chemists of a more qualitative persuasion, David Bower and Bill Maddams then distil their many years of experience into an account of the use of 'group frequencies' and discuss how this approach can be used in copolymer and related analyses. The book concludes with a clear introduction to the use of polarized radiation in deducing molecular orientation.

References to original papers have been kept to the minimum and the authors have carefully identified easily available sources of further information.

In my travels around the country as an external examiner, I frequently find that candidates have used infra-red spectroscopy quite extensively in studying specific aspects of polymer behaviour. All too frequently, however, they have no idea how and why the spectra originate and as a consequence their structural diagnoses rest more on luck than judgement. In many cases supervisors, although expert in other fields, do not seem to understand vibrational spectroscopy any more deeply than their students. This is a great pity since supervisors and students alike often miss really useful yet subtle features already contained in their spectra or misinterpret those they think they see. Bower and Maddams have provided us with a book that will make relapses in the future quite unforgivable.

Many authors who start out to provide a textbook, particularly one at an advanced level, find it impossible to resist the temptation to get carried away and to emphasize their own interests. Try as I might, I could not detect this tendency in this book. Bill Maddams classic work on PVC is described and David Bowers' deep understanding of orientation is given due emphasis but the two areas are completely in context. In a phrase, the book maintains an excellent uniformity of level throughout.

The authors make the point that the book may be of value in supporting final year undergraduate specialist courses. I agree, but the level and specialist nature of the material would, I think, require that such a course was devoted predominantly to vibrational spectroscopy of polymers. No attempt is made in the book to relate the use of vibrational methods to others such as n.m.r., electron microscopy or d.s.c., hence its use in a more general course would be unattractive to students.

To conclude, this is an excellent book filling a definite gap and essential reading for those who aspire to use vibrational spectroscopy in a meaningful way in the study of polymers. I certainly intend to insist that my postgraduates digest its contents when they join my group.

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## New Trends in Physics and Physical Chemistry of Polymers

L.-H. Lee (Ed.)

Plenum Press, New York, 1989,  
662 pages, \$120.00  
ISBN 0306 43383 4

Pierre-Gilles de Gennes has introduced a number of concepts to polymer science which have had a profound influence on the thinking of the scientific community. His ideas on reptation of chains, the behaviour of polymers at interfaces and the dynamics of adsorbed layers are now well known and his outstanding contributions were recognized in 1989 by the American Chemical Society when he received the ACS Award in Polymer Chemistry. At that time a special symposium was held in his honour and the collection

of papers presented has been compiled into a substantial volume of 662 pages called 'New Trends in Physics and Physical Chemistry of Polymers'.

There are 36 contributions in total, covering a range of subject matter which is conveniently grouped under six well balanced headings, thereby reflecting the breadth of de Gennes thinking. These are:

1. Adsorption of Colloids and Polymers (seven papers)
2. Adhesion, Fractal and Wetting of Polymers (six papers)
3. Dynamics and Characterisation of Polymer Solutions (seven papers)
4. Diffusion and Interdiffusion of Polymers (six papers)
5. Entanglement and Reptation of Polymer Melts and Networks (six papers)
6. Phase Transitions and Gel Electrophoresis (four papers)

Each group is followed by a short discussion section which is often a useful adjunct to individual points in certain papers.

An additional feature of note is an appendix listing de Gennes publications from 1956-1988, all 337 of them, which is a formidable effort.

This is a book for the specialist rather than the general reader, but for those with an interest in the work stimulated by ideas propagated by de Gennes, it will make a worthwhile purchase and by modern standards is reasonably priced at the current sterling-dollar exchange rate.

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## Introduction to Polymer Dynamics

P. G. de Gennes

Cambridge University Press, 1990,  
57 pages, £20.00 hbk, £6.95 pbk  
ISBN 0-521-38172-X hbk  
0-521-38849-X pbk

This small volume is the published version of lectures given to the Academia Nazionale dei Lincei, at Milan in December 1986. An editorial note states that "... The books are intended for a broad audience of graduate students and faculty members and are meant to provide a *mise au point* for the subject that they deal