

## 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.

P. J. Hendra

University of Southampton

## 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.

J. M. G. Cowie

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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

with. The symbol of the Academia, the lynx, is noted for its sharp sightedness; the volumes in the series will be penetrating studies of scientific topics of contemporary interest".

As one would expect from this author the promise of the second quoted sentence is amply fulfilled, but to what extent the lectures will provide an intelligible introduction to polymer dynamics for a broad non-specialized audience is more debatable. They will certainly give an idea of the kind of question that has been addressed, and often answered, in the explosive development of fundamental polymer physics initiated in the 1960s and 1970s. They will also give a general impression of the kind of spare, direct argument, often employing scaling laws, that has been applied with such remarkable success by de Gennes and his school. But this is not to say that the non-specialist will find the reasoning easy to follow and, to understand the arguments to the point of finding them convincing, a preliminary perusal of a more explanatory text, such as the lecturer's 1979 book<sup>1</sup>, is probably necessary.

The first chapter deals with the fundamentals of polymer dynamics and includes a discussion of chemical kinetics in polymers.

In the second chapter an intriguing study of protein conformation is presented. Essentially the argument is that the highly complex 3-dimensional shapes of proteins can be explained in terms of the minimum 'loop length' that must occur between the individual members of a group of amino acids placed in close proximity and in a prescribed orientation at a receptor site. According to the foreword by G. Allegra, this work is previously unpublished except as a verbal comment at a conference more than 15 years ago.

A short chapter deals with the dry spreading of liquids on solid surfaces.

The final chapter treats drag reduction and the central idea is that, in the small regions (and short time scales) associated with turbulence, the polymer motion is governed by an elastic modulus rather than by viscosity. A key assumption is that there is a power law relationship between the elongation of the polymer chains and the size of the eddies.

Many research workers in the areas touched upon are likely to obtain some new insight of value from these lectures.

<sup>1</sup> de Gennes, P. G. 'Scaling Concepts in Polymer Physics', Cornell University Press, 1979

*D. Pugh*  
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## Erratum

Book review

*Polymer* 1990, 31, 2220

**Polymer Alloys and Blends: Thermodynamics and Rheology**

The authorship of this book should read:

*L. A. Utracki* and not *L. A. Utracki (Ed.)*

We apologize for this error.

## XIII<sup>th</sup> ANNUAL INTERNATIONAL CONFERENCE ON ADVANCES IN STABILIZATION AND DEGRADATION OF POLYMERS

**MAY 22-24, 1991 – Luzern, Switzerland**

Recent advances in the stabilization and degradation of polymers, many of them yet unpublished, will be presented by leading authorities in these fields. Internationally recognized scientists will act as panel discussion leaders in addition to presenting results of their recent findings in these areas of research.

### INVITED SPEAKERS

**Stabilization of Foamed Polyethylene Communication Cable Over Copper Conductors**  
Maureen G. Chan, AT&T Bell Laboratories, USA

**Stabilization of Organic Coatings with Hindered Amino Ethers**  
Mark S. Holt, CIBA-GEIGY Co., USA

**Recent Studies of the Biodegradation of Polymers and Biodegradable Polymers**  
Samuel J. Huang, The University of Connecticut, USA

**Fluorophosphonites as Co-Stabilizers in the Stabilization of Polyolefins**  
G.J. Klender, Ethyl Corporation, USA

**Mechanism of Energy Dissipation by Ultraviolet Absorbers**  
Horst E.A. Kramer, University of Stuttgart, Germany

**Controlled-Release Antioxidants**  
Roy S. Lehrle, Fiona Keen, Amma Jakob and Szekely, University of Birmingham, UK

**Effectiveness of Hindered Amine Stabilizers Resides in the Production and Regeneration of their Hydroxy Derivatives**  
Jean Marchal and Claude Crouzet, Institut Charles Sadron, France

**Stabilization of Polymers by Hindered Amines**  
Carlo Neri, Silvestro Costanzi, Vincenzo Malatesta, Rosella Farris, EniChem Synthesis (Enimont Group), Italy

**Degradation and Stabilization of Varnishes for Paintings**  
E. Rene de la Rie, National Gallery of Art, USA

**The Role of Singlet Oxygen in Photooxidation of Polymers**  
Ivan Schopov, Bulgarian Academy of Sciences, Calix[n]Arenes as Inhibitors of Polyolefin Oxidation - Efficiency and Proposed Mechanism  
K. Seiffarth, G. Goermar, M. Schultz, Leuna-Werke AG, Germany

**The Influence of Molecular Weight on the Efficiency of Phenolic Antioxidants as Stabilizers for Polypropylene**  
Jiri Tochacek, Research Institute of Macromolecular Chemistry, Czechoslovakia

**Reactions of Amino Radicals with Hydroperoxides, Hydrocarbons and Phenols**  
V.T. Varlamov, USSR Academy of Sciences, USSR

**Weathering Stability Testing**  
G. Zerlaut, DSET Laboratories, USA

**Processing of Polyolefins**  
H. Zweifel, CIBA-GEIGY AG, Switzerland

**SHORT COMMUNICATIONS/POSTER PAPERS:** Participants are encouraged to present either poster papers or short communications (10-15 minutes) on significant recent findings in the areas of stabilization and degradation of polymers. A one-page abstract of the proposed presentations should be mailed to **Dr. A.V. Patsis** no later than April 1, 1991. No manuscripts are required for the short communications or the poster papers.

Scientific Program Chairman, **Dr. Peter Klemchuck** – CIBA-GEIGY Corp., USA

**FURTHER INQUIRIES:** All correspondence pertaining to the conference and the submission of papers should be sent to:

**Conference Director, Professor Angelos V. Patsis**  
Institute of Materials Science, State University of NY, New Paltz, NY 12561 - USA

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