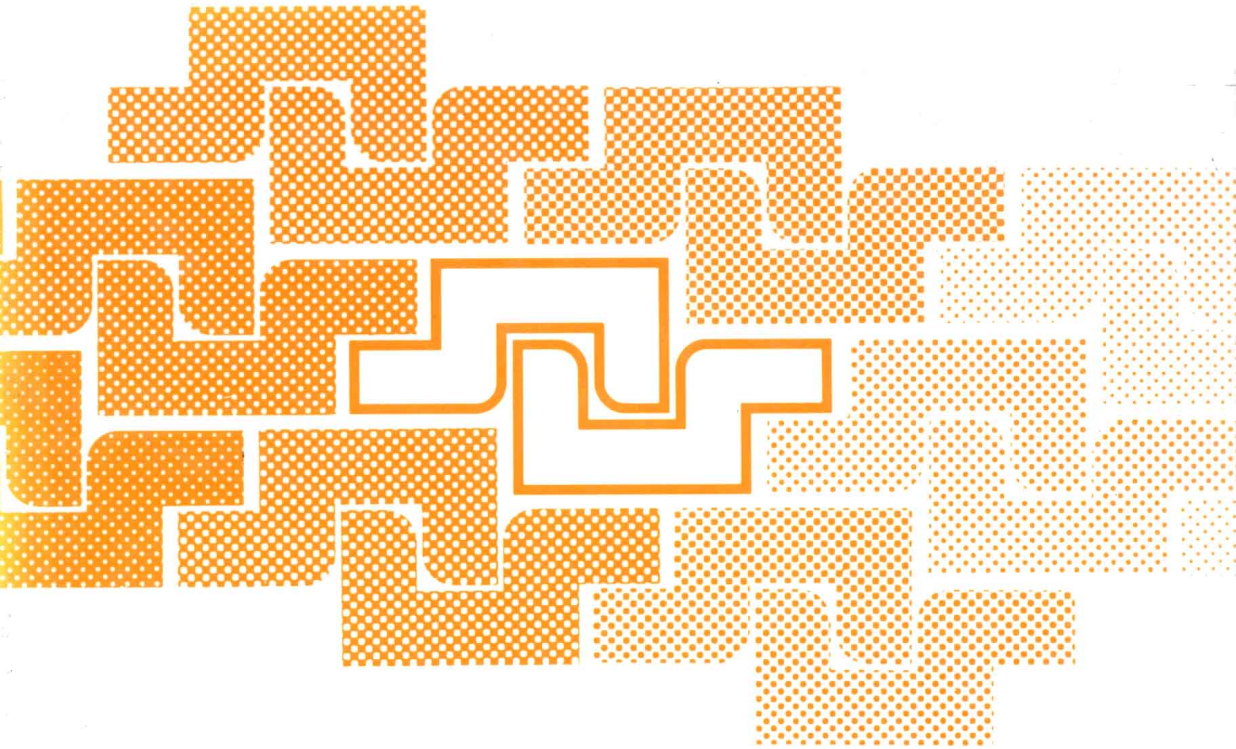

Structure Development During Polymer Processing

Edited by

A.M. Cunha and S. Fakirov

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PREFACE

30 years ago, polymer processing was considered to be a set of operations aiming at imparting a desired shape to the material, while its final properties were defined exclusively by the molecular structure and architecture resulted from the respective synthetic approaches. These two fields of knowledge — polymer processing and polymer structure — grew closer as several scientific and technological works disclosed the microstructure and other morphological features developed by polymeric systems upon different processing conditions.

Even before the real understanding of the polymer structural details, engineers were able to make use of the effect of molecular orientation and to manufacture polymeric fibres with enhanced properties in terms of stiffness and strength. However, it was during the 1970s that the scientific community started to relate microstructure development and the thermomechanical environment associated to different processing techniques. Ever since, very important works were done on semicrystalline, amorphous or blended polymers in order to identify and, recently, to predict the effect of the imposed shear fields and cooling gradients on the final product properties. These efforts led to more accurate processing methods and stimulated new engineering approaches, such as property enhancement through out-of-the-processing as well as on-line control. Modern processing technology has developed further towards the nano level, enabling impacts on the macromolecular structure.

It is the actual framework for new perspectives and new insights into modern polymer processing, that should not be regarded as a simple shape-converting operation anymore, but as a route to the achievement of specific properties of a given system, involving substantial reorganization processes on a molecular level.

These consideration were the scientific and technological motivation for the organization of the NATO-ASI *Structure Development in Processing for Polymer Property Enhancement* that gathered a group of almost 90 scientists from around the world in Caminha (Portugal), in 1999 (May 17–28). The main objective was to review, in a tutorial and comprehensive manner, the recent scientific knowledge and R&D achievements in the fields of the interrelationships between properties, structure and processing of polymeric materials.

This book contains the majority of the contributions of faculty members to that ASI, which are organized in three sections: (i) Structure and Properties, (ii) Structure Development During Processing, and (iii) Structure Development in Blends and Composites.

In comparison to the previous traditional publications, a peculiarity of this one is that

due to the initiative of the Editors, generously supported by the Publisher and by the Contributors, an attempt was made to approach it to a monograph (with respect to both the graphical presentation and the scientific content, also reducing the volume) rather than to the common Conference Proceedings of a meeting. To what extent these joint efforts were successful will be judged by the readers.

Aside from this publication, the Caminha NATO-ASI has enabled intensive scientific discussions among scientists with different backgrounds, experiences, perspectives, age, and origins, promoting contacts that should lead to new cooperations in the near future.

The success of this initiative was possible mainly due to the support of the NATO Scientific Affairs Division both in the organization of the ASI and in the preparation of this book. The ASI was also partially supported by local Portuguese institutions, such as Fundação para a Ciência e Tecnologia, Universidade do Minho, Camâra Municipal de Caminha, Camâra Municipal de Monção, Camâra Municipal de Melgaço and Comissão de Turismo do Alto Minho.

The Editors and the participants greatly appreciate the sponsorship of the NATO Advanced Study Institutes Programme and the financial aid by other sponsors, as well as the cooperation of the University of Minho staff and associate research members, who assured the organization logistics.

Last but not least, the Editors would like to stress that they enjoyed the work with individual Contributors and to thank them for their patience, understanding and support, as well as for the preparation of manuscripts, differing substantially from their presentations during the ASI.

António M. Cunha,
Stoyko Fakirov
Editors

Guimarães, January, 2000

LIST OF AUTHORS

Baltá-Calleja, F. J.
Instituto de Estructura de la Materia, CSIC,
Serrano, 119, 28006 Madrid, Spain

Baer, E.
Center for Applied Polymer Research,
Department of Macromolecular Science,
Case Western Reserve University, Cleveland,
OH 44106-7202, USA

Bevis, M.J.
Brunel University,
Uxbridge, Middlesex, UB8 3PH, UK

Billon, N.
Centre de Mise en Forme des Matériaux – CEMEF,
UMR CNRS 7635, Ecole des Mines de Paris
BP 207, 06904 Sophia Antipolis Cedex, France

Cakmak, M.
Polymer Engineering Department, University of Akron,
Akron, OH 44325-0301, USA

Cunha, A.M.
Department of Polymer Engineering, University of Minho,
4800 Guimarães, Portugal

Evstatiev, M.
Laboratory on Polymers, University of Sofia,
1126 Sofia, Bulgaria

Fakirov, S.
Laboratory on Polymers, University of Sofia,
1126 Sofia, Bulgaria

K. Friedrich
Institute for Composite Materials Ltd.,
University of Kaiserslautern,
67663 Kaiserslautern, Germany

Godinho, J.S.
Department of Polymer Engineering, University of Minho,
4800 Guimarães, Portugal

Haudin, J.M.
Centre de Mise en Forme des Matériaux – CEMEF,
UMR CNRS 7635, Ecole des Mines de Paris
BP 207, 06904 Sophia Antipolis Cedex, France

Hiltner, A.
Center for Applied Polymer Research,
Department of Macromolecular Science,
Case Western Reserve University, Cleveland,
OH 44106-7202, USA

Karger-Kocsis, J.
Institut für Verbundwerkstoffe GmbH,
Universität Kaiserslautern,
Pf. 3049, D-67663 Kaiserslautern, Germany

Kerns, J.
Center for Applied Polymer Research,
Department of Macromolecular Science,
Case Western Reserve University, Cleveland,
OH 44106-7202, USA

Kokturk, G.
Polymer Engineering Department, University of Akron,
Akron, OH 44325-0301, USA

B. Monasse, B.
Centre de Mise en Forme des Matériaux – CEMEF,
UMR CNRS 7635, Ecole des Mines de Paris
BP 207, 06904 Sophia Antipolis Cedex, France

Piccarolo, S.
Università di Palermo, Dip. di Ingegneria Chimica
dei Processi e dei Materiali,
Viale delle Scienze, 90128 Palermo, Italy

Ryan, A.J.
Department of Chemistry, University of Sheffi eld,
Sheffi eld S3 7HF, UK

Serhatkulu, T.F.
Polymer Engineering Department, University of Akron,
Akron, OH 44325-0301, USA

Spruiell, J.E.
Materials Science and Engineering,
University of Tennessee,
Knoxville, TN 37996-2200, USA

Utracki, L.A.
National Research Council Canada,
Industrial Materials Institute,
75 de Mortagne, Boucherville, QC,
Canada J4B 6Y4

Viana, J.C.
Department of Polymer Engineering, University of Minho,
4800 Guimarães, Portugal

Vincent, M.
Centre de Mise en Forme des Matériaux (CEMEF),
UMR CNRS 7635, Ecole des Mines de Paris,
BP 207, 06904 Sophia Antipolis, France

White, J.L.
Institute of Polymer Engineering, University of Akron,
Akron, OH 44325-0301, USA

Wolf, B.A.
Institut für Physikalische Chemie der Universität Mainz,
Welder-Weg 13, D-55099 Mainz, Germany

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