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Peter J. Halley , Graeme A. George
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Chemorheology of Polymers: From Fundamental Principles to Reactive Processing

Understanding the dynamics of reactive polymer processes allows scientists to create new, high value, high performance polymers. *Chemorheology of Polymers* provides an indispensable resource for researchers and practitioners working in this area, describing theoretical and industrial approaches to characterizing the flow and gelation of reactive polymers. Beginning with an in-depth treatment of the chemistry and physics of thermoplastics, thermosets and reactive polymers, the core of the book focuses on fundamental characterization of reactive polymers, rheological (flow characterization) techniques and the kinetic and chemorheological models of these systems. Uniquely, the coverage extends to a complete review of the practical industrial processes used for these polymers and provides an insight into the current chemorheological models and tools used to describe and control each process. This book will appeal to polymer scientists working on reactive polymers within materials science, chemistry and chemical engineering departments as well as polymer process engineers in industry.

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From Fundamental Principles to Reactive Processing

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Preface

Plastics are the most diverse materials in use in our society and the way that they are processed controls their structure and properties. The increasing reliance on plastics for high-value and high-performance applications necessitates the investment in new ways of manufacturing polymers. One way of achieving this is through reactive processing. However, the dynamics of reactive processes places new demands on characterization, monitoring the systems and controlling the complete manufacturing process.

This book provides an in-depth examination of reactive polymers and processing, firstly by examining the necessary fundamentals of polymer chemistry and physics. Polymer characterization tools related to reactive polymer systems are then presented in detail with emphasis on techniques that can be adapted to real-time process monitoring. The core of the book then focuses on understanding and modelling of the flow behaviour of reactive polymers (chemorheology). Chemorheology is complex because it involves the changing chemistry, rheology and physical properties of reactive polymers and the complex interplay among these properties. The final chapter then examines a range of industrial reactive polymer processes, and gives an insight into current chemorheological models and tools used to describe and control each process.

This book differs from many other texts on reactive polymers due to its

breadth across thermoset and reactive polymers
in-depth consideration of fundamentals of polymer chemistry and physics
focus on chemorheological characterization and modelling
extension to practical industrial processes

The book has been aimed at chemists, chemical engineers and polymer process engineers at the advanced-undergraduate, post-graduate coursework and research levels as well as industrial practitioners wishing to move into reactive polymer systems.

The authors are particularly indebted to students, researchers and colleagues both in the Polymer Materials Research Group at Queensland University of Technology (QUT) and at the Centre for High Performance Polymers (CHPP) at The University of Queensland (UQ). Special thanks are due to those former students who have kindly permitted us to use their original material. We would also like to thank Meir Bar for his countless hours of redrawing, editing and proof reading during his sabbatical at UQ. Thanks are extended also to Vicki Thompson and Amanda Lee from Chemical Engineering, UQ, for their tireless printing work. Thanks also go to the Australian Research Council, the Cooperative Research Centre scheme, UQ, QUT and individual industrial partners for their funding of reactive polymer research work.

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