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Advances in Polymer Science

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Aims and Scope

The series *Advances in Polymer Science* presents critical reviews of the present and future trends in polymer and biopolymer science. It covers all areas of research in polymer and biopolymer science including chemistry, physical chemistry, physics, material science.

The thematic volumes are addressed to scientists, whether at universities or in industry, who wish to keep abreast of the important advances in the covered topics.

Advances in Polymer Science enjoys a longstanding tradition and good reputation in its community. Each volume is dedicated to a current topic, and each review critically surveys one aspect of that topic, to place it within the context of the volume. The volumes typically summarize the significant developments of the last 5 to 10 years and discuss them critically, presenting selected examples, explaining and illustrating the important principles, and bringing together many important references of primary literature. On that basis, future research directions in the area can be discussed. *Advances in Polymer Science* volumes thus are important references for every polymer scientist, as well as for other scientists interested in polymer science - as an introduction to a neighboring field, or as a compilation of detailed information for the specialist.

Review articles for the individual volumes are invited by the volume editors. Single contributions can be specially commissioned.

Readership: Polymer scientists, or scientists in related fields interested in polymer and biopolymer science, at universities or in industry, graduate students.

Special offer:

For all clients with a standing order we offer the electronic form of *Advances in Polymer Science* free of charge.

Martin Müller
Editor

Polyelectrolyte Complexes in the Dispersed and Solid State I

Principles and Theory

With contributions by

A.G. Cherstvy · M.A. Cohen Stuart · C. Cramer ·
N.I. Lebovka · S. Lindhoud · A.H.E. Müller ·
D.V. Pergushov · M. Schönhoff · R.G. Winkler ·
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Preface

Nearly one decade ago, a two volume edition “Polyelectrolytes with Defined Molecular Architecture” edited by M. Schmidt appeared in the series *Advances in Polymer Science* and summarized progress in the field at that date. Within the total of 11 chapters, one was dedicated to polyelectrolyte complexes, which addressed interpolyelectrolyte and polyelectrolyte/surfactant complexes as well as theoretical aspects of polyelectrolyte (PEL) complexation.

This new two-volume edition “Polyelectrolyte Complexes in the Dispersed and Solid State: Principles and Applications” is intended to extend the content of this former chapter by bringing together selected state-of-the-art contributions on principles and theory (Volume I) as well as on current application aspects (Volume II) of polyelectrolyte complex (PEC)-based particles and soft matter. In Volume I, progress and new knowledge on theoretical aspects of electro sorption phenomena between PEL and oppositely charged surfaces (A.G. Cherstvy and R.G. Winkler) and of the practically always apparent aggregation and clustering tendency of PEC particles (N.I. Lebovka) are reviewed. Recently identified important dynamic aspects of ion conductivity (C. Cramer and M. Schönhoff) within PEC soft matter and relaxation phenomena within PEL/protein PEC particles (S. Lindhoud and M.A. Cohen-Stuart) as well as structural aspects of interpolyelectrolyte complexes of novel synthetic polyionic species with nonlinear topology and polymer–inorganic hybrids (D.V. Pergushov, A.A. Zezin, A.B. Zezin, A.H.E. Müller) are reviewed. In Volume II, prominent recent applications of PEC particles are reviewed together with an outline of relevant key properties concerning colloidal stability, size, shape, compactness, surface, and biointeraction. The use and tailoring of PEC particle-modified relevant surfaces for paper making (C. Ankerfors and L. Wagberg), solid–liquid separation and water treatment (G. Petzold and S. Schwarz) are addressed. The last three contributions review PEC applications in the life sciences, including the role of PEL/protein complex assemblies in food (S. Bouhallab and

T. Croguennec), the use of DNA/polycation complexes for gene delivery and protection (A. Bertin), and the potential of sizable and shapable nanosized PEC particles in pharmaceutical applications such as controlled drug release (M. Müller).

Dresden, Germany

Martin Müller

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