Multifunctional Polymer-Based Materials
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Frontmatter
More information
CONTENTS

Preface ................................................................. xi

Materials Research Society Symposium Proceedings ................. xiii

MULTIMATERIAL SYSTEMS

Shape-Memory Properties of Nanocomposites based on Poly(ω-pentadecalactone) and Magnetic Nanoparticles ......... 3
Muhammad Y. Razzaq, Marc Behl, and Andreas Lendlein

Characterization of Fe₃O₄ and Fe₂O₃ Ferrogels Prepared Under Uniform Magnetic Field .......................... 9
Kamlesh J. Suthar, Muralidhar K. Ghantasala, Jan Ilavsky, and Derrick C. Mancini

iPP/CNTs Multifunctional Polymer Nanocomposite .............. 15
Parvathalu Kalakonda, Sabyasachi Sarkar, Erin A. Gombos, Georgi Yordanov Georgiev, Germano Iannacchione, and Peggy Cebe

Design of Semi-interpenetrating Networks based on Poly(ethyl-2-cyanoacrylate) and Oligo(ethylene glycol) Diglycidyl Ether ................................................................. 21
Guiseppe Tripodo, Christian Wischke, and Andreas Lendlein

CREATION OF MULTIFUNCTIONAL POLYMER-BASED MATERIALS

One Pot Synthesis of Multifunctional Aramid Aerogels .............. 29
Chakkaravarthy Chidambareswarapattar, Dhairysash P. Mohite, Zachary J. Larimore, Hongbing Lu, Chariklia Sotiriou-Leventis, and Nicholas Leventis
Shape Memory Behavior of Ultra-high Molecular Weight Polyethylene .........................................................91
  Sergey Kaloshkin, Aleksey Maksimkin,
  Maria Kaloshkina, Mihail Zadorozhnyy,
  and Margarita Churyukanova

Soft Microorigami: Stimuli-responsive Self-folding Polymer Films .......99
  Leonid Ionov, Svetlana Zakharchenko,
  Georgi Stoychev, and Evgeni Sperling

Shape-Memory Properties of Electrospun Non-wovens Prepared from Amorphous Polyetherurethanes Under Stress-free and Constant Strain Conditions .................................105
  Tilman Sauter, Karl Kratz, and Andreas Lendlein

**LIQUID CRYSTALLINE POLYMERS**

Manufacturing of Fibres with New Reflective Properties and their Application in Textiles ...........................113
  Olivier T. Picot, Mian Dai, Ton Peijs,
  and Cees W.M. Bastiaansen

Phase Transition Behavior of Main Chain Nematic Liquid-Crystalline Polymers Based on 2-methyl-1, 4-bis[4-(4-pentenyl)oxy]benzoyl]hydroquinone and 2-tert-butyl-1,4-bis[4-(4-pentenyl)oxy]benzoyl]hydroquinone ............119
  Christian Melchert, Marc Behl, and Andreas Lendlein

Mathematical and Numerical Modeling of Liquid Crystal Elastomer Phase Transition and Deformation ....................125
  Mariarita de Luca and Antonio DeSimone

Modeling of Free Radical Polymerization of Azobenzene-based Linear Polymers ...........................................131
  Danish Iqbal, Christian Melchert, Marc Behl,
  Andreas Lendlein, and Sabine Beuermann

**MULTIFUNCTIONAL BIOMATERIALS & CELL-BIOMATERIALS INTERACTIONS**

A New Way to Nanostructure Hydrogels: Electrospin Thermo-responsive Islands-in-the-Sea Nanofibres ..................139
  Jing Wang, Alessandra Sutti, Xungai Wang,
  and Tong Lin
Quantifying Protein Adsorption to Physically Crosslinked Gelatin-based Networks ......................................................... 145
Axel T. Neffe, Benjamin F. Pierce, Joanna Blaszkiewicz, and Andreas Lendlein

Thermal Gelation and Stability of Pectin Grafted with PEPE ........ 151
Harshal D. Santan, Axel T. Neffe, Stefan Kamlage, and Andreas Lendlein

Using Mass Spectrometry to Investigate the Structural Features of Photocrosslinked Co-networks Based on Gelatin and Poly(ethylene glycol) Methacrylates ........................................ 159
Benjamin F. Pierce, Axel T. Neffe, and Andreas Lendlein

Gelation Characteristics and Encapsulation of Stromal Cells in Star Acrylate-functionalized Poly(ethylene glycol-co-lactide) Macromonomers .................................................... 165
Seyedsina Moeinzadeh, Danial Barati, Xuezhong He, and Esmaiel Jabbari

Biomimetic Hemo-compatible Surfaces of Polyurethane by Grafting Copolymer Brushes of Poly(ethylene glycol) and Poly(phosphorylcholine methacrylate) ........................................ 171
Dazhi Yang, Yakai Feng, Marc Behl, Andreas Lendlein, Haiyang Zhao, Musammir Khan, and Jintang Guo

Surface Modification of Polycarbonateurethane by Grafting Phosphorylcholine Glyceraldehydes for Improving Hemocompatibility ....................................................... 177
Wei Gao, Yakai Feng, Jian Lu, and Jintang Guo

MICRO-, NANOSTRUCTURED, AND DRUG RELEASE SYSTEMS

* Calix[8]arene Functionalized Polyglycerol Nanogels for Encapsulation and Stabilization of Fluorescent Dyes ................................. 185
Dirk Steinhilber, Florian Paulus, Andrew T. Zill, Steven C. Zimmerman, and Rainer Haag

Multifunctional Dendritic Architectures: An Investigation of their Mechanical Properties .................................................. 195
Haixia Zhou, Marcel Richter, Regine von Klitzing, and Rainer Haag

*Invited Paper
Functional Nanostructured Porous Si/Hydrogel Hybrids: Synthesis, Characterization and Applications .......................... 201
Ester Segal, Naama Massad-Ivanir, Giorgi Shtenberg, and Maksym Krepker

Determining Loading Kinetics of Drug Releasing Degradable Shape-memory Polymers ................................ 207
Christian Wischke, Susi Steuer, and Andreas Lendlein

Swelling and Release Properties of Functional κ-carrageenan Hydrogel Nanocomposites. ................................ 213
Ana Luísa Daniel da Silva, Ana M. Salgueiro, Sara Fateixa, Joana Moreira, Ana C. Estrada, Ana M. Gil, and Tito Trindade

DIELECTRIC AND ELECTRONIC SYSTEMS

Synthesis and Characterization of Poly(p-phenylene ethynylene)s with Nitroxy Radical Endgroups ......................... 223
Michael Schroeter, Marc Behl, Christoph Weder, and Andreas Lendlein

Soluteochromic Molecular Spectroscopy with a Reference Hydrogen-bond Acid Dendrimer ................................. 229
R. Andrew McGill, Duane Simonson, Julie H. Ta, Viet Nguyen, Yasar Ozten, Chris Kendziora, and Todd H. Stievater

A High-modulus Electroactive Polymer Acting as a Robust Ionomer for Ionic Micro-actuators ............................. 235
Gokhan Hatipoglu, Yang Liu, Ran Zhao, Mitra Yoonessi, Dean M. Tigelaar, Srinivas Tadigadapa, and Q.M. Zhang

Novel Polar-fluoropolymer Blends with Tailored Nanostructures for High Energy Density and Low Loss Capacitor Applications ...... 241
Shan Wu, Minren Lin, David S-G. Lu, Lei Zhu, and Q.M. Zhang

On the Flexoelectricity in Polyvinylidene Fluoride Films ...................... 247
Xiangtong He, Sivapalan Baskaran, and John Y. Fu
Rapid progress has occurred in the field of responsive polymers that can provide, receive, and respond to signals from their environment including interactions with synthetic molecules, biological species, and physical stimuli. Research in functional materials has been driven by the increasing demand for intelligent materials. Furthermore, driven by the motivation that system complexity could be reduced by the integration of multiple functions in one material, multifunctional materials are being developed.

Polymer-based multifunctional materials are realized as hybrid structures (e.g., composites, multifibers, or multilayer constructs) of several distinct material phases, in which each phase contributes a different but necessary function.

Beyond the integration as a multimaterial system, or on the morphological level in single-component materials, single material systems exhibiting multifunctionality are the final goal.

Multifunctional materials could be enzymes, polymeric prodrugs, actively moving polymers (shape-memory effect and shape-changing capability), or polymers for imaging. Examples for independent functions are electrical conductivity, thermal conductivity, biocompatibility and/or degradability, and self-healing capability. Multifunctional materials as single material systems could also be obtained by the hierarchical organization of different reactive groups in different subunits, each responsible for a certain function, such as in dendritic polymers.

Symposium V “Multifunctional Polymer-based Materials” held in Boston, Massachusetts, November 28 – December 2, 2011 at the 2011 MRS Fall Meeting is following the MRS Spring 2009 Symposium NN about “Active Polymers” and gave a highly interdisciplinary scientific community the opportunity to gather and discuss the topics:

- Multifunctional Surfaces and Interfaces
- Stimuli-sensitive and Shape-Memory Polymers
- Cell-Biomaterials Interactions
- Multifunctional Biomaterials
- Liquid Crystalline Polymers
- Multifunctional Polymer-based Materials
- Micro-/ Nanostructured Systems
- Multimaterial Systems
- Encapsulation and Drug Release
- Stimuli-Responsive Hydrogels
- Photosensitive Materials
- Dielectric and Electronic Systems
Symposium V was finalized with 90 oral presentations and 93 posters performed in eighteen sessions enabling a high-ranked scientific exchange.

In the course of a joint session with Symposium KK with the topic Cell-Biomaterials Interactions, Prof. Dr. Mei Wei (University of Connecticut) gave a talk about Apatite/Collagen Scaffolds for Bone Tissue Regeneration. Additional highlights have been the talks of Prof. Dr. Eugene Terentjev (University of Cambridge), who presented a new class of liquid crystal elastomer photo-actuators for haptic display applications, the presentation of Prof. Dr. Joseph M. DeSimone (UNC Chapel Hill), demonstrating the preparation of nano- and microparticles with specific shaping by “rolling”-technology, and the talk of Dr. Urs Duerig (IBM-Research) about the usage of thermolabile polymers for scanning probe microscopy-based preparation of nanostructures, which can be used as data storage devices.

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