Multifunctional Polymer-Based Materials

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PREFACE

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

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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.

We kindly acknowledge financial support for this symposium from IBM Zurich, Switzerland, and Helmholtz-Zentrum Geesthacht GmbH, Germany.

Andreas Lendlein
Marc Behl
Yakai Feng
Zhibin Guan
Tao Xie

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