

# MRS SYMPOSIUM PROCEEDINGS

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## Multifunctional Polymeric and Hybrid Materials

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# **Multifunctional Polymeric and Hybrid Materials**

**MATERIALS RESEARCH SOCIETY  
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# **Multifunctional Polymeric and Hybrid Materials**

Symposium held November 30-December 5, 2014, Boston, Massachusetts. U.S.A.

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## PREFACE

Symposium B, “Multifunctional Polymeric and Hybrid Materials,” was held November 30 – December 5 at the 2014 MRS Fall Meeting in Boston, Massachusetts, USA.

Polymer-based materials offer a vast and enormously flexible platform to provide, receive, and respond to signals from their environment, and the impressive progress in this field includes their use to respond to individual or combined chemical, biological and physical stimuli. In particular, there is an increasing demand for intelligent (self-regulating) materials that integrate multiple functions within their performance. Such multifunctional materials often feature hybrid structures, e.g., (nano)composites, blends, fibrillar or multilayer constructs, and distinct phases separately or synergically contribute to the overall responsive performance, which is further enhanced by the possibility of a hierarchical organization of the structural constituents at various length scales (molecular, nano, and micro). The latter point also encompasses the molecular control of polymer and composite architectures (dendritic/hyperbranched macromolecules, unimolecular micelles, statistic vs. directed colloidal aggregation, etc.).

This symposium proceedings volume includes recent advances in the process of achieving multifunctionality of materials by mimicry of biological structure and interactions, by the presence of natural or biologically active components, such as enzymes or polymeric prodrugs, via complex, but controlled physical behavior, e.g., actively moving polymers (shape-memory, shape-morphing), or by simultaneously performing multiple activities, e.g., interacting with a biological environment while also imaging it. Additional functions include electrical or thermal conductivity, redox behavior, (bio)sensing, temperature-dependent behavior, bio-compatibility and/or controlled degradation, bioresponsive drug delivery and self-healing.

The papers are divided into four sections, representing the principal topics of Symposium B: (1) *Multifunctional Composites*, (2) *Stimuli-Sensitive Polymers and Gels*, (3) *Characterization of Multifunctional Polymer Systems*, and (4) *Structured Surfaces and Multilayered Polymers*. We thank all authors for their contributions, which span these topics. We hope that this collection of articles will inspire the readership to participate in research and facilitate new technology in the challenging and fascinating field of multifunctional materials.

We kindly acknowledge financial support for this symposium from FEI Deutschland GmbH, and RSC-Material Horizons, Royal Society of Chemistry.

Andreas Lendlein  
Nicola Tirelli  
Robert Weiss  
Tao Xie

June 2015

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