Polymer-Based Smart Materials — Processes, Properties and Application
Polymer-Based Smart Materials — Processes, Properties and Application

Symposium held December 2–5, 2008, Boston, Massachusetts, U.S.A.

EDITORS:

Siegfried Bauer  
Johannes Kepler University  
Linz, Austria

Zhongyang Cheng  
Auburn University  
Auburn, Alabama, U.S.A.

Debra A. Wrobleski  
Los Alamos National Laboratory  
Los Alamos, New Mexico, U.S.A.

Qiming Zhang  
The Pennsylvania State University  
University Park, Pennsylvania, U.S.A.

Materials Research Society  
Warrendale, Pennsylvania
CONTENTS

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

Materials Research Society Symposium Proceedings .................... xii

NEW MATERIALS AND CHARACTERIZATION I

Molecular Adsorption and Fragmentation of Bromoform on Polyvinylidene Fluoride with Trifluoroethylene .........................3
   Carolina C. Ilie, Jie Xiao, and Peter A. Dowben

Application of a Chemically Adsorbed Monolayer and Polypyrrole Thin Film for Increasing the Adhesion Force Between the Resin Substrate and the Plated Copper Layer ....................9
   Yuji Ohkubo, Shogo Onishi, Satoshi Miyazawa, Kazuhiro Soejima, and Kazufumi Ogawa

Copying the Natural Skeletal Muscle Design into a New Artificial Muscle System ..................................................15
   Maria J. Bassil, Michael I. Ibrahim, Mario R. El Tahchi, Joseph K. Farah, and Joel Davenas

DEVICE APPLICATION I

Composite Electromagnetic Wave Absorber Made of Aluminum Particles or Sendust Particles Dispersed in Polystyrene Medium ....23
   Kenji Sakai, Yoichi Wada, Yuuki Sato, and Shinzo Yoshikado

Optimization of New Ultralow-k Materials for Advanced Interconnection .......................................................29
   Xuan Li and James Economy

NEW MATERIALS AND CHARACTERIZATION II

Polyaniline Nanostructures for Hydrogen Storage Applications ..........37
   Michael Niemann, Seshu Srinivasan, Ayala Phani, Ashok Kumar, Yogi Goswami, and Elias K. Stefanakos
Operation Characteristics of Ionic Polymer-Metal Composite Using Ionic Liquids
Kunitomo Kikuchi, Masafumi Miwa, and Shigeki Tsuchitani

Dielectric Breakdown of Transformer Insulation Materials Under Cryogenic and Room Temperatures
Horatio Rodrigo, Wolfgang Baumgartinger, Aniket Ingrole, Z. (Richard) Liang, Danny G. Crook, and Steve L. Ranner

Bilayer Microactuator of Two Kinds of Polypyrroles Doped with Different Dopants
Shigeki Tsuchitani, Kosei Chikatani, and Kunitomo Kikuchi

DEVICE APPLICATION II

* High Frequency Length Mode PVDF Behavior Over Temperature
Mitch Thompson, Minoru Toda, and Melina Ciccarone

Membrane as High Performance Biosensor Platform
Xu Lu, Liling Fu, Shaokang Li, Zhuo Xu, Wei Ren, Anxue Zhang, and Zhong-Yang Cheng

Two-Way Shape Memory Polymer Composite and Its Application
Woong-Ryeol Yu, Seok Jin Hong, and Ji Ho Youk

POSTER SESSION: NEW MATERIALS AND DEVICES

Amplified Fluorescence Turn-On Assay for Mercury(II) Based on Conjugated Polyfluorene Derivatives and Nanospheres
Yusong Wang and Bin Liu

Novel Enzymatic Polymerization of Diazo Compounds: A New Group of Dyes
Ferdinando Bruno, Lauren E. Belton, and Diane M. Steeves

*Invited Paper
Materials Properties of Polymer Blends of Poly(3,4-ethylenedioxythiophene)/Poly(styrenesulfonate)/N-Methyl-2-pyrrolidinone (PEDOT:PSS:NMP) and Polyvinyl Alcohol (PVA) ......................................................... 157
  Chang-hsiu Chen, John LaRue, and Richard Nelson

NEW MATERIALS AND CHARACTERIZATION III

Stochastic System Identification of the Compliance of Conducting Polymers ................................................................. 167
  Priam V. Pillai and Ian W. Hunter

Elastic Aerogels and Xerogels Synthesized from Methyltrimethoxysilane (MTMS) ........................................... 173
  Kazuyoshi Kanamori, Kazuki Nakanishi, and Teiichi Hanada

Aromatic Polyurea for High Temperature High Energy Density Capacitors ................................................................. 179
  Yong Wang, Xin Zhou, Minren Lin, Sheng-Guo D. Lu,
  Jun-Hong Lin, and Qiming Zhang

POSTER SESSION

Direction Sensitive Deformation Sensing with CNT/Epoxy Nanocomposites ................................................................. 187
  Samuel T. Buschhorn, Malte H. Wichmann,
  Jan Gehrmann, Lars Böger, and Karl Schulte

Fabrication of an Electrochromic Device Based on Polyaniline-poly(vinyl alcohol)-Natural Polymer Blends ........... 193
  Michael I. Ibrahim, Mario R. El Tahchi,
  Maria J. Bassil, and Joseph K. Farah

Dielectric Response of Ceramic-Polymer Composite with High Permittivity ............................................................... 199
  Xiaobing Shan, Lin Zhang, Pei-xuan Wu,
  Canran Xu, and Zhong-Yang Cheng

Crystallinity Properties of Carbon Nanotube-Polyvinylidene Fluoride Composites ...................................................... 205
  Xiaobing Shan, Pei-xuan Wu, Lin Zhang, and
  Zhong-Yang Cheng
Strain Sensitivity in Ion-Implanted Polymers .................................................. 211
Giovanni Di Girolamo, Marcello Massaro, 
Emanuela Piscopiello, Emanuela Pesce, 
Ciro Esposito, Leander Tapfer, and 
Marco Vittori Antisari

A New Type of Display Device Based on Remote 
Swelling and Collapse of a pH-Responsive 
Microgel ........................................................................................................... 217 
Joseph P. Cook and Jason Riley

Characterization of the Charging and Long-Term 
Performance of Cytop Electret Layers for MEMS 
Applications .................................................................................................... 223
Ulrich Bartsch, Joao Gaspar, and Oliver Paul

The Melt Electrospinning of Polycaprolactone (PCL) 
Ultrafine Fibers .............................................................................................. 229
Chitrabala Subramanian, Samuel C. Ugbolue, 
Steven B. Warner, and Prabir K. Patra

Multi-Scale Grafted Polymeric Nanostructures Patterned 
Bottom-Up by Colloidal Lithography and Initiated 
Chemical Vapor Deposition (iCVD) ............................................................ 235
Nathan J. Trujillo, Salmaan H. Baxamusa, and 
Karen K. Gleason

Electroactive Polymer Motors for Aerospace 
Applications ................................................................................................... 243
Keith Rebello, Margaret A. Darrin, and 
Jerry Krill

New Application of AAO Templates: Periodic 
Patterns of Nanonet Architecture ................................................................. 247
Zhixun Luo, Yuanyuan Liu, Longtian Kang, 
Yaobing Wang, Hongbing Fu, Ying Ma, 
Jiannian Yao, and Boon Loo

Synthesis of Thermoresponsive Copolymers Composed 
of Poly(ethylene glycol) and Poly(N-isopropyl acrylamide) 
for Cell Encapsulation .................................................................................. 253
Tatiya Trongsatitkul and Bridgette Budhlall
PREFACE

Symposium BB, "Polymer-Based Smart Materials—Processes, Properties and Application," held December 2–5 at the 2008 MRS Fall Meeting in Boston, Massachusetts, has shown up with a wide range of new materials, characterization techniques, and applications in devices. Smart materials convert energy from one form into another form, especially into electrical energy. Smart polymer materials are very attractive due to their flexibility, low-cost production and easy processability. Polymers have been shown to exhibit better performance than inorganic materials, such as larger strain responses and energy density.

The symposium provided a platform for researchers from academia and industry interested in smart polymer materials. It stimulated discussions among physicists, chemists, and engineers working in the field of smart plastics. With a focus on materials development, characterization, processing, manufacturing, analysis, design and applications, this proceedings summarizes selected work presented at the symposium.

Siegfried Bauer
Zhongyang Cheng
Debra A. Wrobleski
Qiming Zhang

July 2009
MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS


