

Preface to Forum on Polymeric Nanostructures: Recent Advances Toward Applications

This issue of *ACS Applied Materials & Interfaces* features a Forum on Polymeric Nanostructures: Recent Advances Toward Applications. The Forum is dedicated to Professor Manfred Stamm, at The Leibniz Institute of Polymer Research Dresden, Germany, in celebration of his 65th birthday. It comprises contributions from Professor Stamm's former students, postdoctoral fellows, collaborators, and colleagues. The 28 published articles feature polymer-based nanostructured materials with the latest advances in the investigation of their synthesis–structure–property relations. We anticipate that these papers will help to provide the additional foundation needed to advance various polymer-based applications in such areas as energy production and storage, sustainability of resources, coating, sensing, and biomedical science.

Professor Manfred Stamm is among the most prominent polymer physicists of our time. During the past 35 years, Prof. Stamm has contributed significantly to the broad research area of polymer physics, focusing especially on polymer-based thin films, nanostructures, smart materials and single molecule devices. Over the years Prof. Stamm has continually inspired and guided the community through his service on numerous key European committees and as an outstanding researcher, lecturer, supervisor, administrator, colleague, editor, referee, and author.

Manfred Stamm was awarded his Diploma in Solid State Physics from Frankfurt University. Following this, he joined the research group of Professor E. W. Fischer in Mainz, taking a special interest in scattering techniques to explore soft matter science. After finishing his PhD thesis on neutron scattering, Dr. Stamm built a small angle neutron scattering (SANS) instrument at the Institute of Solid State Research in Jülich. At Brookhaven National Laboratory (USA), Dr. Stamm pioneered a novel neutron reflectivity technique to probe polymer thin films. After 14 years working as a project leader at the Max Planck Institute for Polymer research in Mainz, Dr. Stamm moved to the Leibniz Institute of Polymer Research (IPF) in Dresden in 1999. Since then, Prof. Stamm has been the head of the Institute of Physical Chemistry and Polymer Physics at the IPF and the chair of Physical Chemistry of Polymer Materials at the Department of Chemistry of Technical University of Dresden. Throughout this time, the main purpose of his research activities has been to reach a better understanding and control of polymer interfaces. This research theme is highlighted in this Forum with various contributions that deal with the engineering and characterization of polymer nanostructures, targeting novel applications.

Some of the contributions address fundamental issues about structure and morphology control, such as “Structure and Dynamics of Asymmetric Poly(styrene-*b*-1,4-isoprene) Diblock Copolymer under 1D and 2D Nanoconfinement” by Kremer et al., “Binary and Bidisperse Polymer Brushes—Coexisting Surface States” by Sommer and co-workers, “Poly(*N*-IsoPropylAcrylamide)-based Mixed Brushes: A Computer Simulation Study” by Müller and co-workers, “Nanoporous

Thin Films and Binary Nanoparticle Superlattices Created by Directed Self-Assembly of Block Copolymer Hybrid Materials” by Fahmi et al., “Patterned Diblock Co-polymer Thin Films as Templates for Advanced Anisotropic Metal Nanostructures” by Roth et al., and “Dynamics of Hyperbranched Polymer under Confinement: A Dielectric Relaxation Study” by Anastasiadis et al.

Specially tailored polymer-based coatings are addressed in contributions such as “Tunable Hydrophilic or Amphiphilic Coatings—A “Reactive Layer Stack” Approach” by Uhlmann et al., together with “High-Resolution Metal Nanopatterning by Means of Switchable Block Copolymer Templates” by Gowd and co-workers, “Binary Polymer Brushes of Strongly Immiscible Polymers” by Sidorenko and co-workers, and “A Phoxonic Hybrid Superlattice” by Fytas and co-workers.

Composite materials are investigated in “Hairy Core–Shell Polymer Nanoobjects from Self-assembled Block Copolymer Structures” by Nandan and co-workers, “Gold Nanorod–pNIPAM Hybrids with Reversible Plasmon Coupling: Synthesis, Modeling, and SERS Properties” by Contreras and co-workers, “Soft Nanocomposites—From Interface Control to Interphase Formation” by Gutmann and co-workers, “Thermo-resistant Soft Glassy Suspensions of Polymeric Micellar Nanoparticles in Ionic Liquid” by Tsitsilianis and co-workers, and “Polypropylene/Layered Double Hydroxide (LDH) Nanocomposites: Influence of LDH Particle Size on the Crystallization Behavior of Polypropylene” by Gowd and co-workers.

Structures of conjugated polymers with applications in organic electronics such as organic solar cells or organic field effect transistors are presented in “Morphology, Crystal Structure, and Charge Transport in Donor–Acceptor Block Copolymer Thin Films” by Thurn-Albrecht and co-workers, “Methacrylate Copolymers with Liquid Crystalline Side Chains for Applications As Organic Gate Dielectrics in Solution Processed Devices” by Voit and co-workers, “Influence of the Semiconductor Thickness and Molecular Weight on the Charge Transport of a Naphthalenediimide-Based Copolymer in Thin-Film Transistors” by Kiri and co-workers, and “Amphiphilic and Thermoresponsive Conjugated Block Copolymer with Its Solvent Dependent Optical and Photoluminescence Properties: Toward Sensing Applications” by Kuila and co-workers.

Biorelated and biopolymer research topics are explored in “In Situ Infrared Ellipsometry for Protein Adsorption Studies on Ultrathin Smart Polymer Brushes in Aqueous Environment” by Hinrichs and co-workers, “Anisotropic liquid Capsules from Biomimetic Self-Folding Polymer Films” by Ionov and co-workers, “Highly Porous 3D Fibrous Nanostructured Biopolymer Films with Stimuli-Responsive Porosity via Phase

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Separation in Polymer Blend” by Minko and co-workers, “Directed Growth of Virus Nanofilaments on a Superhydrophobic Surface” by Riekkel and co-workers, “Highly Sensitive DNA Sensor Based on Upconversion Nanoparticles and Graphene Oxide” by Rubio and co-workers, “The Impact of Topographic Cues, Heparin Hydrogel Microstructures, and Encapsulated Fibroblasts on Phenotype of Primary Hepatocytes” by Revzin and co-workers, and “Nanostructured Biointerfaces: Nanoarchitectonics of Thermoresponsive Polymer Brushes Impact Protein Adsorption and Cell Adhesion” by Uhlmann and co-workers.

Highly applied polymer coatings are tackled in “Pressure Sensitive Adhesives under the Influence of Relative Humidity: Inner Structure and Failure Mechanisms” by Müller-Buschbaum and co-workers and “Influence of Poly(ethylene glycol) Segment Length on CO₂ Permeation and Stability of PolyActive Membranes and Their Nanocomposites with PEG POSS” by Abetz and co-workers.

As a whole, the articles in this Forum highlight the significant progress that continues to be made in the development and application of polymeric nanostructures, covering a broad range of realized and potential future applications. Although this Forum is dedicated to Professor Stamm, we also acknowledge the contributions of our dedicated authors and reviewers, who, through their efforts in this important research area, ensure its progress and maintain its vigor.

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■ AUTHOR INFORMATION

Notes

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