

Polyelectrolytes-2016^{1,2}

T. M. Birshstein and E. V. Chernikova

DOI: 10.1134/S1811238217010027

This special issue of *Polymer Science Series C* is devoted to the 11th International Symposium on Polyelectrolytes (ISP) “Polyelectrolytes-2016,” which was held at Moscow State University on June 27–30, 2016.

The International Symposium on Polyelectrolytes, held once every two years since 1995, may be considered the most significant international conference that brings together researchers working in the field of polyelectrolytes. The major international scientific centers are usually selected for organizing the symposium: Max Planck Institute of Colloids and Interfaces, University of Potsdam (Germany, 1995), Yamada Science Foundation (Japan, 1998), College de France (France, 2000), Lund University (Sweden, 2002), University of Massachusetts Amherst (USA, 2004), Leibniz Institute of Polymer Research (Germany, 2006), University of Coimbra (Portugal, 2008), Fudan University (Shanghai, China, 2010), Université de Genève (Switzerland, 2012), and finally Tel Aviv University Center for Nanoscience and Nanotechnology (Israel, 2014). The fact that this symposium was organized in Moscow is evidence of the high level of science development in Russia. Wide international representation both among invited speakers and among regular participants made this symposium a notable event for the world polymer community. In total, about 170 scientists from more than 15 countries attended the symposium, and they have submitted more than 200 reports.

On the invitation of the International Advisory Committee and National Organizing Committee, invited lectures were presented by leading Russian and foreign scientists: T.K. Bronich (USA), P. Dubin (USA), A. Guiseppi-Elie (USA), A.V. Kabanov (Russia/USA), K. Levon (USA), M. Muthukumar (USA), M. Rubinstein (USA), S.A. Sukhishvili (USA), M. Olvera de la Cruz (USA), T.M. Birshstein (Russia), O.V. Borisov (France/Russia), E.Yu. Kramarenko (Russia), D.V. Pergushov (Russia), A.A. Yaroslavov (Russia), E.B. Zhulina (Russia), M. Ballauff (Germany), K. Kremer (Germany), R. Netz (Germany), W. Richtering (Germany), U. Scheler (Germany), J.P. Gong (Japan), Y. Osada (Japan), A. Zinchenko

(Japan), F. Leermakers (Netherlands), J. van der Maarel (Singapore), L. Piculell (Sweden), K. Procházka (Czech Republic), Y.I. Talmon (Israel), H. Tenhu (Finland), and F. Winnik (Canada).

The contributed and poster papers presented during the symposium sessions included the following topics: polyelectrolytes of complex architecture, polyelectrolyte complexes and multilayers, polyelectrolyte gels and networks, theory and simulations of polyelectrolytes, natural polyelectrolytes, polyelectrolytes for biomedicine and pharmaceuticals, and functional polyelectrolyte systems: membranes, sensors, and adsorbents.

This special issue includes papers which cover practically all the topics of the symposium. The opening two papers are devoted to polymeric gels. The review article by Y. Osada illustrates the diversity of the properties of hydrogels, including composite hydrogels, which makes it possible to use them as artificial soft tissues. The article by T. Sun, K. Cui, and J.P. Gong summarizes the results of the synthesis and the study of the properties of a new class of hydrogels based on polyampholytes. These hydrogels are self-recovery systems with high toughness and are capable of self-healing after cutting.

Next, the paper by A. Zinchenko and V.G. Sergeev reviews the recent progress in preparation of DNA-based materials (DNA is a unique macromolecule for design of various matrices) that can be used as reactors, adsorbents, components of electric circuits, etc.

In the article by R.Yu. Milusheva and S.Sh. Rashidova, the results of the study of antibacterial properties of chitosan *Bombix Mori* and nanochitosan are discussed. The latter is able to increase significantly the immune response of living systems; this was demonstrated by studying mice.

The next group of articles pertains to experimental study of the problems of self-assembly of polymers containing ionogenic units and formation of interpolyelectrolyte complexes.

In the review paper by E.A. Lysenko et al., the self-assembly of diblock copolymers containing hydrophobic and polyelectrolyte blocks in water-salt media is studied. This self-assembly leads to the formation of block copolymer micelles with interpolyelectrolyte shell. Their dispersion stability and structural and physicochemical characteristics are determined by the

¹ The text was translated by the authors.

² The 11th International Symposium on Polyelectrolytes “Polyelectrolytes-2016” was held under financial support of the Russian Science Foundation (project 15-13-30007).

composition of interpolyelectrolyte shell, pH, and ionic strength of solution. These micelles may be considered as a special type of polyelectrolyte nanoparticles combining the properties of polyelectrolyte micelles and interpolyelectrolyte complexes.

The article by E.A. Litmanovich et al. is devoted to the study of the influence of chain microstructure (block or gradient monomer unit distribution) of the copolymers of acrylic acid and 4-vinyl pyridine on their self-organization in aqueous solutions and on the adsorption from solution.

Next, the article by A.V. Sybachin et al. is devoted to the investigation of the complexes of solid and liquid anionic liposomes, including cholesterol-containing ones, with polymeric microspheres with grafted polycationic chains (spherical polycationic brushes).

The results of the synthesis and the study of the self-assembly of polybetaines based on (tridecyl)aminocrotonate and methacrylic acid are discussed in the article by A. Shakhvorostov et al.³

This subject is continued in the series of the articles devoted to the problems of the theory of self-organization and computer simulations of self-organization of polyelectrolytes of various architectures. Thus, in the article by K. Procházka et al., the comparison of the potential of two methods of mesoscale simulations of polyelectrolyte self-organization is presented—molecular dynamics and dissipative particle dynamics. The paper by K. Friess, A. Sagidullin, J. Meier-Haack, and

U. Scheler is devoted to the mobility of polymeric chain in polyelectrolyte multilayers. Finally, theory of self-organization of dendritic polyelectrolyte brushes is discussed in the article by E.B. Zhulina and O.V. Borisov.

In the last series of articles, the problems concerning the study of solutions of polyelectrolytes and hydrophilic polymers are discussed. D. Mukherji and K. Kremer present the results of explicit solvent all-atom simulations and generic simulations of poly(*N*-isopropyl acrylamide) solution in a mixture of water and methanol. They demonstrate the correlation between phase separation and preferential binding of poly(*N*-isopropylacrylamide) to methanol. In the article by O.A. Dommès et al., the results of the synthesis and the study of diluted solutions of copolymers of *N*-methyl-*N*-vinylacetamide and *N*-methyl-*N*-vinylamine are discussed. The totality of hydrodynamic techniques applied by the authors makes it possible to determine and analyze the influence of electrostatic interactions on the basic conformation characteristics of the macromolecules. R.R. Amirov et al. show the possibility of paramagnetic NMR probing for the analysis of the complexes formed by oppositely charged polyelectrolytes. L.M. Timofeeva et al. consider the conductivity of aqueous solutions of polyelectrolytes.

Summarizing, we hope that this issue, which comprises both survey and research articles, will be of interest to the readers. We would like to express our appreciation to the reviewers for their invaluable contribution in preparing this special issue.

³ The article will be published in *Polymer Science, Series B* **59** (4) (2017).