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ACADEMY OF SCIENCES OF THE CZECH REPUBLIC

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

SELF-ASSEMBLY IN THE WORLD OF POLYMERS

10 – 14 July 2016, Prague



80th PRAGUE MEETING ON
macromolecules



Book of Abstracts and Programme

NOVEL AMPHIPHILIC BLOCK-GRADIENT COPOLYMERS OF STYRENE AND 2-DIMETHYLAMINOETHYL ACRYLATE

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Amphiphilic block copolymers dissolved in aqueous solutions form a range of different nanostructures. Such nanoaggregates can differ in size and morphology (micelles, nanospheres, lamellas, polymersomes etc.) and their formation strongly depends on the intra-molecular hydrophobic-hydrophilic balance.¹ Nevertheless, when the copolymer solution presents a dynamic equilibrium, the dimensions and even morphology of the nanostructures can be changed by varying of external parameters, such as pH, ionic strength and temperature.^{2,3} The response to a specific external stimulus depends on the nature of monomeric unit (ionic pH-sensitive or/and thermo-sensitive) constituting the copolymer. These copolymers are attractive for a wide range of applications in different fields, such as nano-electronics, agro-chemistry and nano-medicine.

This work is dedicated to the preparation and the characterization of a novel type of amphiphilic block-gradient copolymers of styrene and 2-dimethylaminoethyl acrylate synthesized by nitroxide-mediated controlled radical polymerization. The determination of the reactivity ratios for the comonomers units and the characterization of the microstructure of the copolymers will be showed, as well as the study of their pH- and thermo-controlled self-assembly in water.

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THE CONFORMATIONAL AND HYDRODYNAMIC PARAMETERS OF NOVEL HYPERBRANCHED PYRIDYLPHENYLENE POLYMERS

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Branched polymers (BPs) find numerous applications in technological processes. Also there are obvious advantages of such macromolecules over dendrimers (another branched molecule, which is monodisperse in regard to both size and structure), viz the facile synthesis and relatively low cost of final product. Furthermore BPs possess higher solubility and lower viscosity, than linear polymers of analogous structure.

The efficient and facile A₆+B₂ approach has been proposed to synthesizing of hyperbranched pyridylphenylene polymers (HBPPP) using Diels-Alder polycycloaddition of the first-generation, six-functional pyridine-phenylene dendrimer (A₆) and the aromatic bis(cyclopentadienone)s (B₂) [1]. The newly synthesized HBPPP samples were studied in present work and their conformational and optical characteristics were obtained. The study has been accomplished using the unique combination of molecular hydrodynamics and optical methods. On the basis of hydrodynamic data the conclusions on conformational parameters were formulated. Furthermore, the conformational comparison of synthesized sample series was carried out.

Moreover computer simulation of HBPPP was carried out with HYDRO software and conformational parameters were calculated for two limiting cases (first, sphere and, second, rod model) [2]. The simulation results were found to be in good agreement with experimental data.

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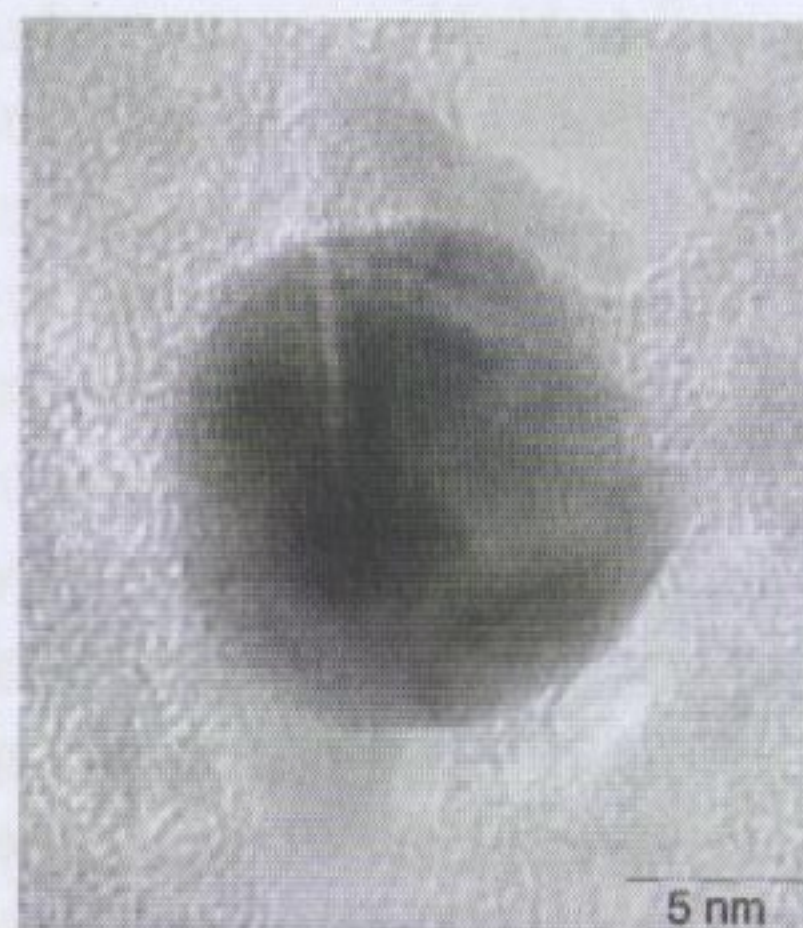
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THE STUDY OF ARGENTUM NANOPARTICLES STABILIZED WITH MODIFIED PEG

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In recent decades the growing interest is demonstrated by multidisciplinary scientific groups in the study of nanoparticles (NPs) on the basis of noble metals (gold, silver, platinum). Former, this is explained by the intermediate position taken by these formations between the atomic-molecular level and the condensed matter state and latter, due to the fact that this NPs show unusual, interesting and useful properties [1, 2]. In particular systems containing noble metal NPs have broad prospects for their use as components for creating nanomaterials in microelectronics and optical devices, in obtaining of high performance and selective catalysts for the synthesis of new composite materials which are used in modern medicine, pharmacy, cosmetics and food industry.



In this study PEG was modified with end dendritic fragments containing amino groups. This modified PEG can act as a reductant and stabilizer of silver NPs. The investigation of the process of their formation, as well as the resulting system represents the important task. For resolving this problem the molecular hydrodynamic methods (dynamic light scattering, velocity sedimentation) and TEM have been used for both to study the components of the complexes and the resulting formation. The fact of NP formation has been established. Furthermore the dimensions of resulting NPs have been determined and compared within data of engaged methods. The satisfactory agreement of results was demonstrated.

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SYNTHESIS, CHARACTERIZATION AND PHOTOCATALYTIC ACTIVITY OF POLYPYRROLE/TiO₂ AND POLYPYRROLE/ZnO COMPOSITES

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Titanium dioxide (TiO₂) and zinc oxide (ZnO) can be used as photocatalysts for water purification. However, one particular interest is given on the integration of inorganic TiO₂ and ZnO nanoparticles with conducting polymers^{1,2} because the resulting nanocomposites may possess unique properties and enhanced photocatalytic activity in comparison to pure TiO₂ and ZnO, using UV and also visible light. It is needed to explore the appropriate structure of polypyrrole that can induce activation of TiO₂ and ZnO photocatalyst since the synthesis of organic/inorganic hybrid materials can result in a synergistic and complementary feature, increasing TiO₂ and ZnO photocatalytic efficiency.

In this paper several different composites of polypyrrole/titanium dioxide and polypyrrole/zinc oxide (PPy/TiO₂ and PPy/ZnO composites) were studied. Composite samples were characterized by X-ray powder diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), UV-Vis spectroscopy and scanning electron microscopy (SEM). The photocatalytic efficiency of prepared composite samples was determined by following the decomposition of Reactive Red 45 (RR 45) dye under UV and visible light, which was monitored by UV-Vis spectroscopy (as a change in absorbance of characteristic wavelength at 542 nm). The obtained results showed good photocatalytic efficiency of nanocomposite samples under UV light. Some of the samples also showed excellent photocatalytic effect under visible light.

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