

Nanocomposites and Nanomaterials

Preparation of Detectable Polymersomes Based on Poly(Amino acid) Block Copolymers

A.V. Hubina^{1,2}, A.S. Paderina¹, E.G. Vlach¹ and T.B. Tennikova¹

¹ *Institute of Chemistry, St. Petersburg State University, Universitetskii pr. 26, 198504, St. Petersburg, Russia*

² *Institute of Macromolecular Chemistry of NAS of Ukraine, Kharkivske shose 48, 02160, Kyiv, Ukraine*

The polymersomes prepared from poly(amino acid) block copolymers can be applied for various biomedical applications, in particular, such as drug delivery, gene delivery, basis for artificial cells, etc. Further modification of the nanoparticle surface with special label molecules allows the development of the nanoparticles detectable by means of different investigation techniques, including fluorescence, NMR or EPR imaging, and others.

The traditional way for synthesis of poly(amino acids) is the ring opening polymerization (ROP) of α -amino acid-*N*-carboxyanhydrides (NCA). As initiators of NCA ROP the amines are widely utilized. In this research, the methods for preparation of polymersomes containing covalently bound paramagnetic and luminescent fragments were developed. The application of amino-bearing labels as initiators of NCA ROP allowed the one-step introduction of paramagnetic and luminescent fragments at terminal position of polymer chain. After amphiphilic block-copolymer self-assembly the bound labels are localized at hydrophilic part of nanoparticles that, in turn, makes possible their easy detection.

Following this idea, the series of poly(*L*-glutamic acid)-*b*-poly-*L*-phenylalanine and poly-*L*-lysine-*b*-poly-*L*-phenylalanine was synthesized using nitroxide radical 4-amino-TEMPO as NCA ROP initiator as well as poly(*L*-glutamic acid)-*b*-poly-*L*-leucine and poly-*L*-lysine-*b*-poly-*L*-leucine containing the organometallic luminescent Pt(II) complex. The size distribution and morphology of nanoparticles obtained after self-assembly were explored by dynamic light-scattering and transmission electron microscopy, respectively. The effect of the paramagnetic and luminescent label introduction was investigated by X-band EPR spectroscopy and luminescent microscopy, respectively.

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