Nanocomposites and nanomaterials

Poly(amino acid) self-assembled nanoparticles for drug delivery

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Polymersomes represent self-assembled polymer nanoparticles formed from amphiphilic block copolymers and suitable for drug delivery system fabrication. The aqueous core can be used for encapsulation of different therapeutic molecules such as synthetic drugs, proteins, peptides and DNA [1]. The membrane can integrate hydrophobic drugs within its hydrophobic core.

Poly(amino acids) is a class of biocompatible and biodegradable polymers very attractive for the different fields of bioapplication. The most economical and expedient process for synthesis of poly(amino acids) is the polymerization of α-amino acid-*N*-carboxyanhydrides (NCA). The traditional way of synthesis is the ring opening polymerization (ROP) with use of nucleophilic or basic initiators [2].

In the present work the poly(glutamic acid)-*b*-polyphenylalanine (polyGlu-*b*-Phe) was synthesized by a step-wise mode. At first step the polymerization of poly(γ-benzyl glutamate) NCA using primary amine ((3-aminopropyl)triethoxysilane) was carried out. Then the polymer obtained was applied as a macroinitiator for Phe NCA polymerization. After deprotection of γ-benzyl protective groups, the polymer got the amphiphilic properties. The block copolymer obtained was characterized with gel-permeation chromatography. Polymer nanoparticles were prepared by dispersing the copolymer in buffer solutions of different pH (7.4, 8.4, 9.5 and 10.5). The morphology of self-assembled nanoparticles was evaluated using transmission electron microscopy. Simultaneously with polymersomes preparation the encapsulation of model compound, e.g. bromophenol blue, was performed. The maximum encapsulation efficiency was achieved at pH 10.5 in 48 hours and was equal to 30%. The effect of target compound concentration on encapsulation efficiency was also studied.

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References

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