Polymeric Micelles Prepared from Post-Polymerization Modification of Pentafluorophenylester-containing Polymer

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Abstract: Polymeric micelles assembled from amphiphilic copolymer have been regarded as effective vehicles for controlled delivery of therapeutic agents such as drug, gene, and protein. We have recently demonstrated that stepwise post-polymerization modification of a single pentafluorophenyl ester-bearing homopolymercan be used as a facile route to redox-responsive nanogels. Here in this research, we would like to explore further the versatility of this similar approach to fabricate pH responsive micelles. Poly(pentafluorophenyl acrylate) (PPFPA) was first synthesized by reversible addition-fragmentation chain transfer (RAFT) polymerization.Post functionalization of PPFPA with varied equivalent of 1-amino-2-propanol yielded amphiphilic random copolymers of PPFPA-*r*-PHPA having different composition.The copolymers can self-assemble to form micelles in aqueous with sizes less than 200 nm. By reacting the pentafluorophenyl (PFP) groups remaining in the nanoparticleswith 1-(3-aminopropyl) imidazole (API), pH responsive micelleswere generated as evidenced by the disintegration of the nanoparticles upon pH decrease from 7.4 to 5.0. This may be explained as a result of charge transition of the imidazole rings from neutral to positively charged upon pH reduction. These developed nanoparticles possess a strong potential to be used as carriers for targeted delivery of therapeutic agent of which the release can be triggered under acidic environment.

Keywords: Post-polymerization modification, active ester, pH responsive, polymeric micelles

References

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