Abstract

Amphiphilic block copolymers self-assemble into clinically efficacious nanostructures, whose size, stability, and surface chemistry can be easily adjusted for each purpose. This versatility has prompted the vast scope of their biomedical applications, especially in the field of drug delivery. In particular, polyester-based nanoparticles have been used in gene, nucleic acid, therapeutic protein and drug delivery for their in vivo biocompatibility and biodegradability. However, most studies have only focused on amphiphilic copolymers with either short hydrophobic segments, no modification or a single preparation pathway. This diploma thesis focuses on the synthesis of poly(ethylene oxide)-*b*-poly(caprolactone) copolymers containing propargyl groups using two parallel approaches, namely a copolymerization with a modified monomer and a post-polymerization modification. A subsequent thiol-yne click reaction with 1-thioglycerol yielded copolymers with vicinal diols, which can reversibly bind to benzoxaborole- and boronic acid-derived compounds. Both synthetic pathways were evaluated based on macromolecular characteristics afforded by nuclear magnetic resonance spectroscopy and by size exclusion chromatography. Furthermore, we characterized the self-assembled nanoparticles by static and dynamic light scattering and visualized them by conventional, negatively stained, and cryogenic transmission electron microscopy. Finally, we encapsulated a model drug into spherical micelles and investigated the effect of drug loading on their properties. Ultimately, these findings will enable the reproducible preparation of fine-tuned amphiphilic block copolymers capable of pH-induced binding to benzoxaborole- and boronic acid-based anticancer agents, thereby fostering further studies on their biomedical applications as nanocarriers in targeted drug delivery.