

Synthesis and Complexation Behavior of Pluronic-*b*-Poly(acrylic Acid) Copolymer with Doxorubicin

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Abstract—Poly(acrylic acid) (PAA) was attached on both termini of Pluronic P85 copolymer (EO₂₇PO₃₉EO₂₇) via atom transfer radical polymerization (ATRP) to produce a novel block copolymer, PAA-*b*-P85-*b*-PAA (P85PAA). The P85PAA-DOX complex formation and drug loading were strongly dependent on the PAA segment and pH, where the protonation of the carboxyl groups in the PAA segment at pH<7.2 reduced the binding sites of DOX onto P85PAA chains, resulting less DOX uptake at low pH. The composition of the copolymer-DOX complexes that at pH 7.2 was close to the stoichiometric (1:1 mol Dox:carboxyl ratio), indicating the dominance of the electrostatic interactions between cationic DOX molecules and carboxyl groups. DOX loading at pH 5.0 reduced to 0.6:1 molar ratio of DOX:carboxyl indicated that protonation of the carboxyl reduced the DOX binding to the P85PAA block copolymer. DOX release from the complex is highly pH-responsive process, where 57% of encapsulated DOX was released in 30h at pH7.2, and the cumulative release fraction was accelerated to 95% by decreasing the pH to 5.0. Thus, complexation of DOX with P85PAA yielded a drug delivery system affording a pH-triggered release of DOX in acidic environment pH5.0.