World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:9, No:01, 2015

Self-Assembled Nano Aggregates Based On Polyaspartamide Graft Copolymers for pH-Controlled Release of Doxorubicin

Authors : Van Tran Thi Thuy, Cheol Won Lim, Dukjoon Kim

Abstract : A series of biodegradable copolymers based on polyaspartamide (PASPAM) were synthesized by grafting hydrophilic O-(2-aminoethyl)-O'-methylpoly(ethylene glycol) (MPEG), hydrophobic cholic acid (CA), and pH-sensitive hydrazine (Hyd) segments on a PASPAM backbone. The hydrazine group was effectively cleaved to release doxorubicin (DOX) conjugated on PASPAM in an acidic environment. The chemical structure of the polymer and the degree of substitution of each graft segment were analyzed using FT-IR and 1H-NMR spectroscopy. The size of the MPEG/Hyd/CA-g-PASPAM copolymer self-aggregates was examined by dynamic light scattering (DLS) and transmission electron microscope (TEM). The mean diameter of the self - aggregates increased from 125 to 200 nm at pH 7.4, as the degree of substitution of CA increased from 10 to 20 %. The release kinetics of DOX was strongly affected by the pH of the releasing medium. While less than 30% of the DOX-loaded was released in about 30 h at pH 7.4, more than 60% was released at pH 5.0 within the same time. The viability tests of human breast cancer cells (MCF-7) and human embryonic kidney cells (293T) show the potential application of MPEG/Hyd/CA-g-PASPAM copolymer self-aggregates in the controlled intracellular delivery for cancer treatments.

Keywords : pH-sensitive, drug delivery, polyaspartamide, self-assembly, nano-aggregates
Conference Title : ICFPM 2015 : International Conference on Functional Polymeric Materials
Conference Location : Singapore, Singapore
Conference Dates : January 08-09, 2015