Colloidal Stability of PLGA Nanoparticle Dispersions Containing Adsorbed PNIPAM-DMA$^+$ Copolymers and Their Gellation Behaviour

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In this work the properties and temperature triggered gelation of poly(D,L-lactide*co*- glycolide) (PLGA) dispersions are investigated. The dispersions were prepared by interfacial deposition in aqueous solution containing a poly(*N*-isopropyl acrylamide) (PNIPAm) graft co-polymer produced using a micro-initiator of quaternarized *N*,*N*-dimethylaminoethyl methacrylate (DMA$^+$), where the PNIPAm had a chain length of around 20kDa. The co-polymer of PDMA$^+$-PNIPAm was also tested on its own for comparison.

Copolymer with and without PLGA nanoparticles were tested for gellation in a water bath, these were compared to the same preparations produced in pH 7.0 buffer. The buffer allowed for the copolymer to gel at a lower concentration, it also decreased the aggregation of the PLGA particles and showed a larger drop in the gellation temperature from pure copolymer to copolymer coated PLGA nanoparticles.

The copolymer coated PLGA particles were buffered to pH 7.0 and were characterized using SEM, photon correlation spectroscopy, UV-visible spectroscopy and electrophoretic mobility measurements. Using UV-visible spectroscopy it was seen that the coated PLGA particles are sterically stabilised at room temperature. Using electrophoretic mobility this was confirmed.

Using copolymers containing differing ratios of DMA$^+$ to PNIPAm, it was found that the iep of the copolymer increases as DMA$^+$ concentration decreases in the copolymer. It also showed that the gellation temperature can be tuned by changing the polymer used to coat the particles.