Investigating the Interactions of Nanoscale Calcium Phosphates with Polymer additives

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Current challenges involved in the design and preparation of functional nanoparticles include the difficulty of overcoming nanoparticle aggregation. The formation of aggregates is thermodynamically favourable; however it prevents the full functionality of nanoparticles from being expressed. If the nanoparticles could be dispersed, this would increase their functionality and improve their application to medicine and dentistry. The project aims to encapsulate apatite nanoparticles with functional polymer coatings to demonstrate an enabling technology with the possibility of opening new opportunities in medicine, dentistry and other non-health sectors.

Commercial low and high molecular weight poly(acrylic acid) was added to the synthesis of fluorhydroxyapatite (FHA) and hydroxyapatite (HA) nanoparticles. Analysis via FTIR, XRD, TGA and TEM showed the inclusion of the polymer in the (F)HA samples had an effect on the morphology and size of the particles. Other polymer additives including linear copolymers of poly(ethylene glycol-b-hydroxyethyl acrylamide), synthesised by SET LRP polymerisation were included in the synthesis of (F)HA showing varying effects on the morphology and size of these particles. Ongoing work is looking into the effects of other polyelectrolytes and phosphorylated polymers to determine their effect on the growth of (F)HA nanoparticles.

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