Biodegradable drug delivery vehicles produced by controlled ring-opening polymerisations

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Abstract

Polymers are often employed as drug carriers to provide protection to encapsulated therapeutic molecules against premature metabolism and clearance *in vivo*. Proteolytic enzymes may be exploited to trigger the swelling and/or degradation of (poly)peptide-containing carrier vehicles, while reduced environmental pH may be exploited to trigger the hydrolysis of ester linkages in (poly)ester-containing carrier vehicles, resulting in controlled payload release, *on-demand*. We report the creation of several biodegradable nanomaterials from the n-carboxyanhydride ring-opening polymerisation (NCA ROP) and o-carboxyanhydride ring-opening polymerisation (OCA ROP). Cyclic monomers have been obtained by converting selected alpha amino acids into their corresponding carboxyanhydrides. Subsequently, ROPs have been employed to covert the cyclic monomers into a range of delivery vehicles, including monodisperse (nano) particles, chemical hydrogels and vegetable oil-based organogels, that selectively release encapsulated payload molecules upon interaction with acidic environmental pH and/or enzymes that are over-expressed at particular disease sites

Biography

Mthulisi Khuphe (BSc, MSc) is a final-year PhD candidate at the University of Leeds, under the supervision of Dr. Paul D. Thornton and Prof. James T. Guthrie. He also holds an MSc in Polymers and Surface Coatings Science and Technology from the University of Leeds. His research focuses on the creation of stimuli-responsive biomaterials using controlled ring opening polymerizations of n-carboxyanhydrides and o-carboxyanhydrides of α-amino acids. He has twice published part of his PhD work in reputable Royal Society of Chemistry journals and is a holder of the prestigious Beit Trust Scholarship and the Leeds International Research Scholarship. His other research interests are in polymers in surface coatings, textile materials and textile coloration.

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