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Poly ethylene glycol mediated bioprocessing of poly hydroxyl alkanoates for the production of novel biomaterials

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Polyhydroxyalkanoates (PHAs) are a diverse family of biopolyesters ranging fromrigid and crystalline to amorphous and flexible materials. Attractive physiochemical and material properties coupled with an inherent biodegradability and biocompatibility have led to commercialisation of its most common members, polyhydroxybutyrate (PHB) and its copolymer with polyhydroxyvalerate (PHBV), as environmentally friendly bioplastics and biomaterials for medical applications. Polyethylene glycol (PEG) mediated bioprocessing for the production of PHAs offers a means of composition and molecular weight control, while endcapping the biopolymer chains also forms amphiphillic, naturalsynthetic hybrids. These bioPEGylated PHA hybrids display subtle but significant changes to their physiochemical and material properties compared to their PHA counterparts. For example: bioPEGylated PHB has a greater elongation to break of 20.6%, increasing from 8.4% for PHB. Furthermore, bioPEGylation can significantly alter biological properties, promoting progression of cell cycle in adult stem cells. PEG mediated bioprocessing has also been shown to offer control of PHA composition; for example: increasing the yield of unsaturated PHAs. Selective biodeuteration of PHAs and their hybrids permits characterisation of their polymer chain conformations using small angle neutron scattering (SANS). SANS permits non-destructive analysis of PHAs in conditions synonymous with their processing and application. Understanding the effects of topological interactions on molecular motion of PHA chains is of primary importance in establishing the relationships between the molecular structures and processing of these commercially important biomaterials. Results suggest that PEG mediated bioprocessing of PHAs should be investigated as a means of controlling the production of PHAs and the synthesis of new biomaterials.

Biography

Foster heads the Bio/polymer Research group at UNSW and has track record in the production, characterisation and development of novel biopolymers for environmental and medical applications. He has published more than 70 papers in reputed journals, including books and patents, and serves as an editorial board member for a number of international journals. A Fellow of the Society for Biology (FSB), he has received a number of prestigious awards and is a former Fulbright Senior Scholar, Marie Curie Incoming International Fellow and Sir Anthony Mason Fellow. His research has been publicized internationally in conventional media including TV and radio.

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