Centre for Sustainable Chemical Technologies; University of Bath

Project Title:	Sustainable Bio-based Composite Materials
Lead Supervisor and co-supervisors:	Professor Matthew Davidson (Department of Chemistry), Professor Marcelle McManus, Dr Sophie Parsons (both Department of Mechanical Engineering)
Industrial Partner:	National Composites Centre – Dr Tim Young and Dr Ffion Martin

Project Summary

Fibre-reinforced polymer composite materials are lightweight, strong and durable so have a wide range of applications including in transport, construction and renewable energy. While these materials often have strong sustainability credentials in use, their sustainability remains a challenge during manufacture and at end of life.

These composite materials use a fossil-derived polymer matrix. Alternatively, bio-based polymers offer a promising route towards a low-carbon economy and away from non-renewable materials use. This multidisciplinary project will address the sustainability of composite materials across their whole life cycle by developing new bio-based thermoplastic polyamides and polyester, investigating their potential use as composite materials and considering their end-of-life options, including chemical recycling. Given the importance in understanding system-wide impacts, throughout the project direction will be informed by life-cycle assessment to ensure that materials and processes are designed for sustainability.

The project will encompass aspects of: (i) polymer synthesis and characterisation; (ii) polymer and composite processing and testing; and (iii) sustainability and life-cycle assessment. The project will be based in the multidisciplinary Centre for Sustainable Chemical Technologies at Bath but close collaboration with the nearby National Composites Centre in Bristol will mean that significant periods will be spent using their state-of-the-art composite manufacturing facilities.

The successful applicant will have a first or upper second class degree in a relevant science or engineering discipline and will motivated by contributing to sustainability in an important sector, by working across disciplines, and by a combination of fundamental and applied research.

Sustainability issues addressed

Replacement of finite fossil-based resources with bio-based alternatives.

Development of new polymers for composite materials designed for end-of-life recycling.

Enhancing performance of composite materials for lightweighting, renewable energy applications

Development of new approaches to life-cycle assessment of composite materials.