

Bath Monash Global PhD Programme in Sustainable Chemical Technologies

Project Title:	Developing Thymidine-Based Green Self-healing Polymers
Supervisor at Bath:	Dr. Antoine Buchard
Supervisor at Monash:	A/Prof. Kei Saito (lead)
Home Institution:	Monash University
Indicative period at Host Institution:	12 months with exact dates to be confirmed

Project Summary

Intrinsically self-healing polymers have the ability to heal damage by the use of an appropriate stimulus. This healing can restore the mechanical properties of a damaged polymer allowing for a return to service without the need for replacement of the polymer. When used as a coating, a self-healing polymer can ensure the continued protection of the underlying structure after damage, with minimal downtime of the component and no replacement of the coating necessary.

Photo-stimulated self-healing polymers which can heal the damages via light irradiation are a promising new class of materials especially for coatings. One of the ways to produce photo-stimulated self-healing polymers is to incorporate photo-reversible units in polymer structures and Saito's group has been working on creating self-healing polymers by incorporating thymine, coumarin and other photo-reversible units that can undergo 2+2 cycloaddition reaction in polymer structures. On the underhand, Buchard's group has developed thymidine based polycarbonates by ring opening polymerisation to create biodegradable polymers from renewable resources. Thymidine has the potential to undergo 2+2 cycloaddition reaction and the idea here is to convert this thymidine based polycarbonates into self-healing polymers to prepare self-healing polymers which are biodegradable.

This project will involve an aspect of organic synthesis, polymer synthesis and polymer characterization techniques.