Spider-silk Inspired Hybrid Materials with Advanced Properties

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Location: Mawson Institute, University of South Australia, Adelaide, Australia

Research Area: Polymer Science, Peptide Engineering, Functional Materials

Project outline:

Nature’s high complexity and efficiency has always attracted the attention of scientists, with the aim of understanding its fascinating structures and processes, and imitating their sophisticated function. Nature has modulated and optimized the properties of biopolymers over billions of years via exquisite nanoscale engineering. For example, peptides are vital to all forms of life; by carefully refining the primary sequences of peptides nature has engineered their secondary and tertiary structures to achieve the desired functions. Spider silk has also been long studied for its blend of high strength and flexibility, resulting from crystalline protein domains tethered together by amorphous regions.

Using the engineering principles and building blocks of natural systems we intend to develop biohybrid materials with application to advanced material fabrication. The student will develop novel polymer-peptide conjugates that mimic the structure of natural materials, with the ultimate aim of generating functional materials with superior properties. The potential outcomes of the project are advanced materials with application to construction, bioengineering and aerospace.

About Adelaide:

Adelaide is the capital of South Australia and offers a very high standard of living (top 6 in the world according to “The Economist”), with great climate, food, wine, beautiful unspoiled nature and beach environments, in an inexpensive setting.

The Mawson Institute (MI) has recently been established at the University of South Australia, with strong support from the South Australian Government to research new manufacturing technologies. Manufacturing is an important and substantial part of South Australia’s economic base. The MI promotes a strategy based upon strong basic and applied research that encourages scientific and technological innovation within the manufacturing sector. Fundamental to this is the Institute’s multidisciplinary approach, building research teams in concentrations that encompass a diverse range of disciplines, and collaboration with partners from both academia and industry. The institute is based in two new state-of-the-art buildings with outstanding research facilities.