**Nanocellulose-derived materials**

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Cellulose represents the most abundant renewable polymer on Earth. Its earliest human use dates back thousands of years, with extensive utility today in products such as paper, cellophane, explosives, textiles and dietary fibres. During the last decade, there has been a large amount of work surrounding the conversion of a broad range of biomass sources into nanocellulose, which includes cellulose nanocrystals and nanofibres.

Nanocellulose materials form an exciting sub-class of a broader family of polysaccharide-based nanomaterials. Nanocellulose can be derived from plants (e.g. wood, grass, cotton), marine animals (e.g. crustacean shells, tunicates, algae or ‘sea squirts’), and bacteria. Nanocellulose boasts desirable mechanical properties such as high specific stiffness and strength, and excellent chemical and thermal stabilities combined with low weight and biodegradability, which make them ideal candidates for a range of different applications. While nanocelluloses derived from various sources share a common molecular backbone, their structure, properties, surface chemistry, cost and practical uses can vary enormously depending upon the plant or animal sources and method of extraction or isolation.

This presentation gives an overview of the fundamental aspects of nanocellulose production and applications and also gives several examples of our activities on using nanocellulose derived from Australian arid spinifex grasses for a range of different applications.

Consistent with a hypothesis that extreme environments drive the evolution of plants with unusual material properties, we discovered that Australian arid spinifex grass is a unique and low-cost source of flexible cellulose nanofibers of very high yield, aspect ratio, ductility and toughness1. We have clearly demonstrated that from *Triodia pungens* grass we can readily isolate nanofibres with an average width of below 20 nm after a mild pulping procedure followed by either a low mechanical energy treatment or a mild sulphuric acid hydrolysis2-4.

**References**

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