Technology Transfer Opportunity

Amyloid and Amyloid-like Structures As Mechanically Functional Biomaterials

OPPORTUNITY:

Novel Biomaterials

- Methods, uses, compositions such as adhesive, sealants and coatings, scaffold material, composite material, comprising amyloid-like materials such as fibrils
- Amyloid-like materials in particular those made from fruit or vegetable proteins (including waste proteins)
- Amyloid-like materials imparting good mechanical strength to a variety of materials
- Inhibition of amyloid formation as an anti-bio-fouling strategy.

Description of Technology

Summary: Researchers at the Conway Institute of Biomolecular and Biomedical Research, UCD have found newly developed adhesives that optimise the use of nanoscale structural properties of amyloid fibrils to produce natural adhesives with properties tailored for environmental success. To date they have identified amyloid in both temporary and permanent natural adhesives and in adhesives that cure in air or in seawater.

Amyloid fibrils play an important mechanical role in a number of natural adhesives. Measuring the nanoscale mechanics of these structures elucidates that important differences exist between amyloids in different adhesives, thus providing a unique insight as to how to approach biomimicry of amyloid-based synthetic adhesives in order to obtain specific adhesives with superior bonding capabilities to suit different applications.

The biomimetic approach proposed here is based on amyloid cross β-sheet protein quaternary structures to develop a strong but washable temporary adhesive able to bond to a range of different surfaces. It has been shown that amyloid is used in many natural adhesives to add both adhesive and cohesive strength.

Advantages of Amyloid films/adhesives

- Can support substantial loads with small volumes of material even when subjected to high shear forces in a marine environment.
- Used for temporary attachment.
- Free from VOC's (Volatile Organic Compound)
- Insoluble and can be repeatedly washed without damage. Not degraded by salt solution.
- Non- brittle.
- Used to bind a broad range of surfaces in a broad range of environments.
- Templating possible; potential to be self-renewing if washed with protein solution.
- Readily self-assembles to act as a self-healing material if damaged.

Market

The adhesives industry as a whole has gone through significant change in the last few years mainly due to increasing legislative control over the emission of VOC's.

The global adhesives market's focus is on developing adhesives that produce low VOC, are renewable, recyclable, and biodegradable. The focus is on starch and soy protein since they are considered to be inexpensive, abundant, and annually renewable. In doing so, the overall market for biobased adhesives is expected to increase by 2010. Newer markets in the application listed are growing at a rate of 5-10%/year.

Typical applications for bioadhesives include;

- Medical/healthcare; topical wound closure devices, surgical adhesive devices, drug-delivery systems, oral care, sutures, bandages, orthopaedic implants, consumer and veterinary wound care, tissue adhesives, and medical implants.
- Transportation; automotive sheet moulding compounds, civil and rail infrastructure, and marine applications
- Packaging and Electronics; made from raw materials such as starch, dextrin, animal glue, fish glue, caesins. Include; food trays, caps and containers, along with cosmetics and personal care, bookbinding.
- Wood and its Composites
- Construction.

Inventors

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Intellectual Property Status

WO2007105190 (Pub. date; 2007-09-20) and US2007266892 (Pub. date; 2007-11-22)

Opportunity Sought

Available for licensing, co-development partners or investors.

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