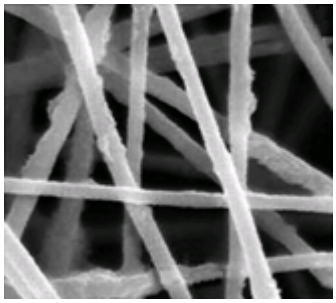
SFS

A new production technology for high performance silk biomaterials.

SFS is a versatile and inexpensive production method for fibroin-based biomaterials to produce fibers that combine biocompatibility and high performance



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Technological Offers type

Technological solutions

Research and innovation areas

- Bioeconomy, Biotechnology and Food Systems
- Health and Wellbeing

ODS

Available from: 2020

Where?

Advanced Structural Materials and Nanomaterials Center for Biomedical Technology

Keywords: | biomaterial | Health | silk

Brief description of the technology solution and the added value it provides

A novel spinning system allows the production of protein fibers under a wide range of conditions, leading to biomaterials with properties that can be tailored for their intended use. Its application to silk fibroin endows the natural material with additional advantages that make it extremely well suited as scaffolding biomaterial for the treatment of tendon and ligament pathologies that demand short-term high mechanical performance along with utmost biocompatibility and cell interaction.

Description of the technological base

A novel spinning technology (SFS) allows the spinning of protein fibers through an inexpensive and environmentally friendly procedure that enables adapting the material to its intended use.

Fibroin obtained from silkworm silk is processed into fibers exhibiting the excellent properties of the natural silks (biocompatibility and high performance) and are endowed with emergent properties such as mechanical pre-stressing and biological activity. This new combination of properties makes them ideal for applications in Medicine that range from sutures to scaffolding bioactive biomaterials for cell therapies and Tissue Engineering. In particular, these fibers are especially suited to treatments on diseased or injured tendons and ligaments, where the mechanical performance at early stages is critical.

"Biocompatible and bioactive high-performance biomaterials can be used in a wide range of orthopaedic therapies, increasing healing chances and decreasing convalescence time"

Market demands

- There is an increasing need for the production of high performance, cell-responsive biomaterials for mechanical demanding applications such as sutures, threads and membranes for replacing or reinforcing structural supportive tissues and scaffolds in Tissue Engineering.
- This need is especially evident in the therapy of tendons and ligaments. Present solutions usually require the use of auto- or allografts and does not support early mobilization.
- Current solutions with either biodegradable or permanent biomaterials are largely inadequate; resorbable polymers, such as poly-lactic acid or poly-caprolactone, are usually reabsorbed by the body in an uncontrolled manner and permanent polymers, such as polyaramides and polypropilene produce debris upon degradation that leads to chronic inflammation. In addition, these classical biomaterials does not provide an adequate cell environment and mechanical response.
- At present there is not adequate material that can serve as scaffold in Tissue Engineering of tendons and ligaments, due to the required demand of biocompatibility, bioactivity and high mechanical performance.

"An adequate solution for the therapy of diseased or injured tendons and ligaments that prevents the usage of grafts is missing"

Competitive advantages

- SFS technology imparts silk fibroin biomaterials outstanding mechanical properties in terms of strength and toughness, and adds the possibility of incorporating built-in-stresses to produce self-tightening sutures.
- Silk fibroin biomaterials can be presented in several formats from individual fibers to yarns or strips.
- SFS processing preserves the extreme biocompatibility of Silk fibroin biomaterials and can tune their resorbability and bioactivity
- Silk fibers can be functionalized by SFS processing to increase its biological activity with serveral adhesion proteins and growth factors.
- Potential debris from Silk fibroin fibers is composed of proteins, which ensures its natural removal from the organism.

Development stage

- Concept
- Research
- **Lab prototype**
- Industrial prototype
- Production

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