"MICROSTRUCTURES OF SILK" VCU # 12-111

VIRGINIA COMMONWEALTH UNIVERSITY

Applications

- Tissue engineering scaffolds
- Regenerative medicine
- Stent meshes, wound healing
- Implantable Bioelectronics
- Microfabrication
- 3D Printing
- Biosensors
- Photonics
- Drug delivery

Advantages

- Customizable shape and strength
- Scalable for manufacture
- Biodegradable
- Flexible, optically transparent

Inventors

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Market Need

Photolithography is a method of creating patterns using UV light and light sensitive materials and is capable of making structures and shapes from a few nanometers to several centimeters. Currently, most photoactive materials used in photolithography are synthetic polymers. Natural, biodegradable and renewable silk biopolymers provide viable green chemistry alternatives for applications requiring high precision microfabrication. Integrating high resolution fabrication platforms with natural biopolymers to form rationally designed structures while attaining desired spatial resolution, structural complexity and mechanical properties can impact diverse areas. Examples include building effective tissue engineering cellular scaffolds, flexible, implantable bioelectronics, biophotonics and drug delivery devices.

Technology Summary

This is a novel method for creation of photoactive silk for use in microfabrication of tissue engineering scaffolds and other applications including high resolution 3D printing. Proof of concept studies using silk fibroin to create a new class of light-activated proteins have been completed. Silk is known for its biocompatible properties, specifically a non-immunogenic response. By rendering it photoactive, it becomes the first natural protein that can be manipulated into precise, micro or nano-scale patterns. These patterns form 2D sheets which can be built up into 3D structures. This makes it an ideal material for scaffolding. The new material is stronger than silk and the mechanical properties can be customized further by altering the lithograph. The technology uses a simple synthesis procedure which can be scaled for manufacture and may be transferable to other proteins.

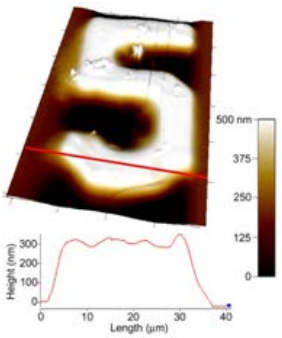

Figure 1 This figure is a topographical, microscopic image of a pattern formed by the new material on a Si plate.

Technology Status

Patent pending: U.S. and foreign rights are available.
This technology is available for licensing to industry for further development and commercialization.