

Devices and Methods for Producing Synthetic Silk with Superior Characteristics (RFT-505)

Invention Summary

Scientists at NDSU have developed a device and methods to produce spider silk that has the ability to produce silk similar to the silk produced by a spider pasting.

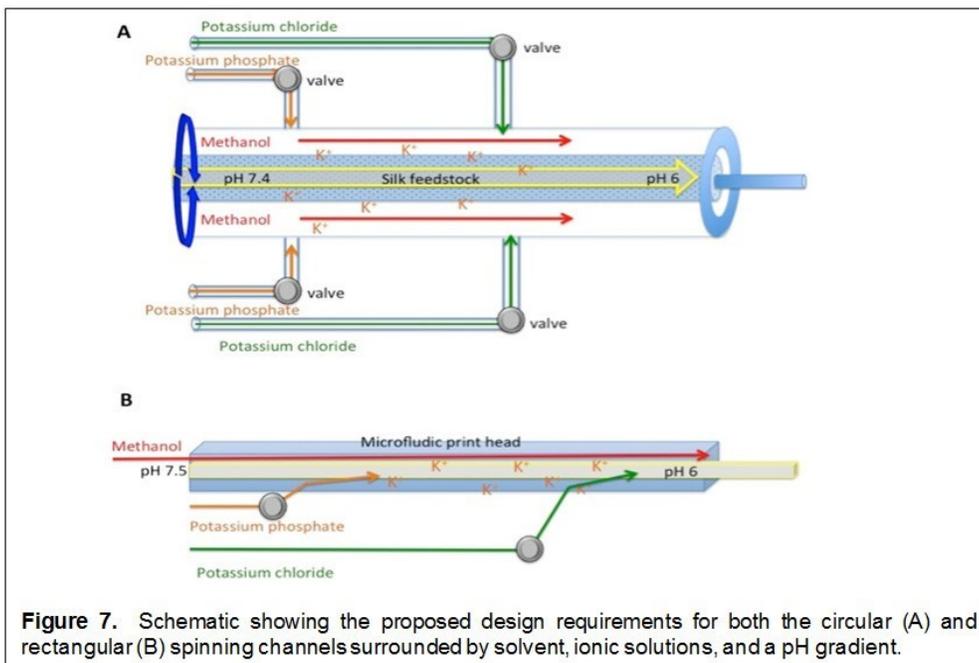


Figure 7. Schematic showing the proposed design requirements for both the circular (A) and rectangular (B) spinning channels surrounded by solvent, ionic solutions, and a pH gradient.

Our device mimics the pH and ionic gradients found in the natural gland, but also pulls the fiber from the device as opposed to extruding it via pushing. This replicates native shear forces that are important for proper alignment of silk proteins. The result is a solid silk fiber that integrates the natural elements of fiber production (i.e. pressure, pH, and ionic gradients) to more accurately replicate the spider's ability to produce silk. Additionally, application of an electric field to the microfluidic device is a unique combination of microfluidic spinning and electrospinning to create a better fiber.

Other researchers have produced artificial silk that is different from natural silk produced by the natural process, which uses different mechanical forces, and includes pH, ionic, and pressure gradients. As a result, other synthetic silk has uncharacteristic, mechanically inferior properties in comparison to that of natural silk or the silk produced by this technology.

Benefits

- More closely mimics the mechanical and physical conditions of spider spun silk

- Mimics the physical and performance characteristics of natural spider silk

Applications

The technology produces a superior artificial spider silk by using a microfluidic system functioning as an artificial spinneret, an electric field and gradients of various types to simulate spun silk as opposed to extruded silk. This results in a high performance artificial/synthetic spider silk fiber.

Patents

A provisional patent application was filed on January 11, 2016. The technology is available for licensing/partnering opportunities.

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