Chapter 10

The Future of Silk: Integrating Technology with Sericulture

Wisdom Leaf Press
Pages number, 54–59

https://journals.icapsr.com/index.php/wlp
DOI: 10.55938/wlp.v1i4.168

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Abstract

Silk Fibroin (SF) is a versatile material that can be reconfigured into a variety of shapes like films, carpets, hydrogels, and sponges using a variety of processes. Recent advances in fabrication techniques, including as micro-patterning and bio-printing, have enabled the development of sophisticated SF-based scaffolds. These scaffolds have uses in bone, cartilage, ligament, tendon, skin, wound healing, and the tympanic membrane, with future opportunities and difficulties to address. This study examines the functional features of SF, including di-electricity, piezoelectricity, electron loss, and environmental sensitivity. It discusses silk fibroin preparation procedures as well as current advancements in its application as a basic material. The study also examines advanced works that use silk fibroin as functional components, as well as the limitations and future directions of silk fibroin-based flexible electronics. The study investigates the use of SF as a wound dressing, its efficacy in both in vitro and in vivo conditions, and its potential uses in the treatment of chronic and acute wounds, including burns. Sponge, hydrogels, nano-fibrous matrices, scaffolds, micro/nanoparticles, and films are all examples of biomaterials containing SF and its derivatives. To offer a thorough grasp of the issue, the study compares SF-based therapies to other natural polymers. This article gives a detailed summary of the current state of development for functional silk protein hydrogel. It discusses the cross-linking processes, characteristics, benefits, and limits of various hydrogels. The article also covers other forms of hydrogels, such as high strength, injectable, self-healing, adhesive, conductive, and 3D printable. The hydrogels' applications in tissue engineering, sustained medication release, wound healing, adhesives, and bioelectronics are discussed. The development opportunities and constraints of silk protein functional hydrogels are also discussed. The study's goal is to contribute to future innovation by encouraging logical design of novel mechanisms and the effective implementation of target applications.

Keywords

Silk Fibroin (SF), 3D Bio-Printing, Hydrogels, Bio-Ink, Bombyx Mori, Flexible Electronics

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