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Synthesis Of Nanofibers For The Development Of Artificial Tactile Sensor

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Abstract

Tactile sensation in human skin is performed by specialized cells called **mechanoreceptors**. Factors such as surgical procedures, skin burns, injury, and nerve damage may lead to impaired sensation. For these reasons, various methods and approaches are developed to revive tactile sensation. In this poster, a step-by-step procedure to synthesize **nanofibers** for the development of artificial tactile sensor is presented.

Keywords: Tactile, Mechanoreceptors and Nanofibers

Introduction

- Human skin is the largest organ in the human body. Underneath the skin are four cutaneous mechanoreceptors (Johnson, 2001) as shown in the Fig.1. These receptors are primarily responsible for tactile perception such as sensing hot, cold, force, pressure, and vibrations. With the process of transduction and encoding this sensory information is turned into an electrical impulse and then sent out to the central nervous system (CNS) for motor response (Hao et al., 2015).
- The sensory ability of human skin is often compromised or impaired due to ageing (Decorps et al., 2014), injury, nerve damage, skin burns, and surgical procedures.
- To revive the sensory ability of skin, a wide variety of novel approaches and materials are reported to fabricate the tactile sensors (Yang et al., 2017). In this poster, the synthesis of nanofibers from Bombyx mori silk cocoons for the development of artificial tactile sensors is presented (Wang et al., 2017).

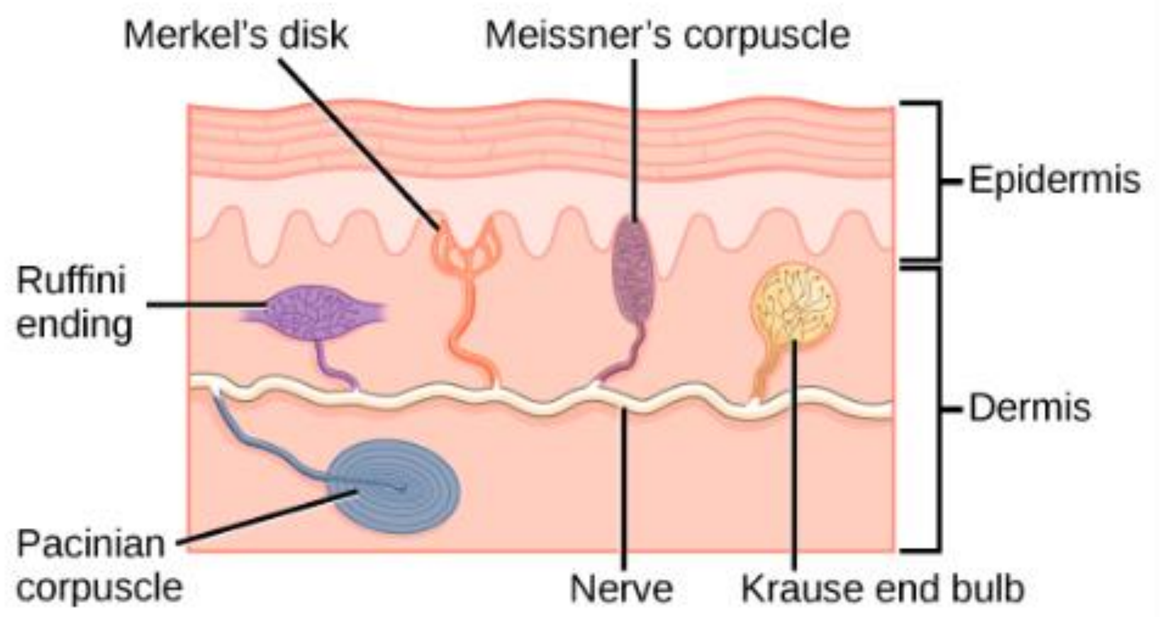

Fig. 1. Primary Mechanoreceptors

(*Somatosensation | Boundccccless Biology*, n.d.)

Procedure

Following are the steps involved in the synthesis of nanofibers from the Bombyx mori silk cocoons as show in Fig.2 :

1) Extraction of solution from Bombyx mori silk cocoons
2) Synthesis of nanofibers from Silk Fibroin (SF) (Protein) solution using electrospinning
3) Analysis of developed nanofibers using scanning electron microscope (SEM)

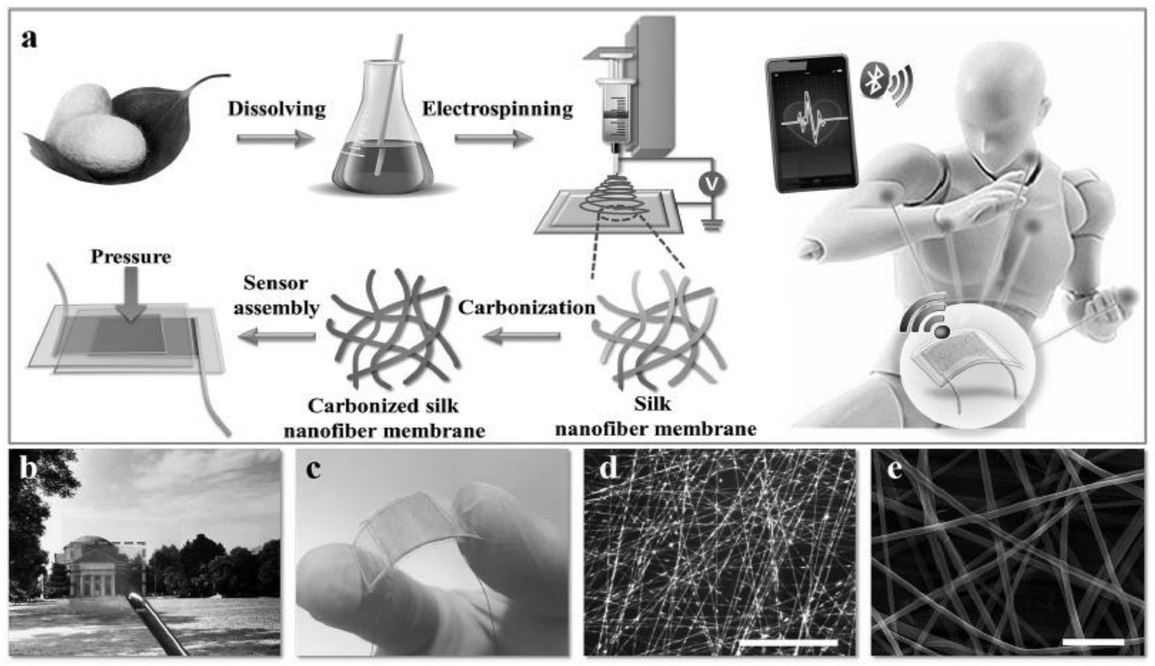

Fig. 2. Synthesis of Nanofibers from the Bombyx mori silk cocoons (Wang et al., 2017)

Results

Table 1 summarizes the results reported of the research carried out by (Wang et al., 2017).

Parameter	Result
Concentration of silk fibroin	8%
Operating voltage of electrospinning machine	$20kV$
Diameter of the nanofibers	$350\ nm$
Sensitivity	$34.47\ kPa^{-1}$
Response time	$< 16.7\ msec$
Stability	$> 10{,}000\ cycles$
Transparency at 800nm UV-Vis spectroscopy	$90.75\ \%$

Conclusion

Tactile perception is an essential function of human skin. Without this, it would be impossible to perform routine tasks. Numerous methods are developed to quantify and revive the tactile sensation. Synthesis of nanofibers from the Bombyx mori silk cocoons is only one of these ways. Integration of these fibers underneath the skin is still an exciting avenue to explore.

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