

Nano-Bio-Engineered Silk Matrix based Sensing Devices for Molecular Bioanalysis

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Abstract

Silk is a fibrous protein, has been a part of human lives for centuries and was used as suture and textile material. Silk is mainly produced by members of certain arthropods such as spiders, butterflies, mites, and moths. However, recent biotechnological advances have revolutionized silk as a biomaterial for various applications ranging from diverse sensors to robust fibers. The biocompatibility, mechanical resilience, and biodegradability of the material make it a suitable candidate for biomaterials. Silk can also be easily converted into several morphological forms, including fibers, films, sponges, and hydrogels. Provided these abilities, silk has received excellent traction from scientists worldwide for various developments, one of them being its use as a bio-sensor. The diversity of silk materials offers various options, giving scientists the freedom to choose from and personalize them as per their needs. In this review, we foremost look upon the composition, production, properties, and various morphologies of silk. The numerous applications of silk and its derivatives for fabricating biosensors to detect small molecules, macromolecules, and cells have been explored comprehensively. Also, the data from various globally developed sensors using silk have been described into organized tables for each category of molecules, along with their important analytical details.

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