

Silk fibroin based multifunctional materials

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Abstract

Silk fibroin is a commonly available natural biopolymer produced in specialized glands of arthropods, such as silkworms or spiders, scorpions, mites, bees and flies. This biopolymer has a long history of use in textile production and also as sutures or treatment of skin wounds. Silk fibroin has been increasingly explored in other areas of biomedical science where we can find a higher morphological diversification of silk biomaterials like films, electrospun fibers, 3D porous scaffolds or nanoparticles. In recent years it has been demonstrated that fibroin is an excellent material for active components in optical devices. This new application opens the way towards the development of multifunctional optoelectronic devices, which in perspective can be made fully biocompatible and eventually bioresorbable. Moreover, fibroin can be added to other biocomponents in order to modify the biomaterial properties leading to optimized and total different functions. These improvements can go from higher cell adhesion in tissue engineering or enhanced optical transparency, smoothness or flexibility in optoelectronic devices.

The tuning and completely understanding of silk fibers physicochemical properties and interaction with other elements are of crucial importance for the improvement of already existent silk-based materials and the basis for the development of new products.