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Functional silk-like fibers

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Spider silk is one of the most extraordinary natural fibers which are assembled from one or more silk proteins each comprising multiple domains. Besides the outstanding mechanical properties, the silk is biodegradable and biocompatible. Nevertheless, spider silk is still not widely used by human in daily life or industry due to the difficulty in large scale farming posed by the territorial and cannibalistic behavior of spiders. In order to make use of "nature's super fibers", bio-mimetic production of spider silk is a good option. Recently, we have found that a single repetitive unit of a prey-wrapping silk protein can form silk-like fibers under shear force. Due to its small size, high expression level in E. coli and easy modification by incorporating functional groups, the repetitive unit is suitable to be fabricated into various biomaterials. Here, we present the production of silk-like fibers with protease activity. The repetitive unit fused to a protease still formed silk-like fibers in diameters of ~10μm under shear force. Further processing by sonication, fibers with diameters in the nanometer scale were generated. The fused protein with additives could be spun into nanofibers by electro-spinning. All the fibers were bioactive and could be reused for more than 20 times.

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