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Silk Fibers: the interplay of their sequence / structure with mechanical properties

Nature produced a wide variety of materials with an extensive array of interesting structures which have been explored and adapted for human use. One of the best natural materials is silk, which has been used since ancient times. As a functional fiber, silk features exceptional mechanical properties such as high tensile strength and great extensibility, making it one of the toughest materials known. Hence, it has drawn the great attentions of scientists to explore the structure of this biologic protein fiber. We present here the current understanding of molecular composition, secondary structures in spider dragline silk and Bombyx mori silk. How the structure of the natural silks relates to the remarkable mechanical properties are also discussed. Clearly, these fundamental achievements have the potential to contribute to the development of abilities for biomimetic polymers and a wide range of enhanced applications.

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