Investigation of Structural and Mechanical Properties of Biomaterials and their Applications

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Owing to their superior and tunable mechanical properties, the applications of biomaterials in biomedical areas have attracted great research interests. Among different species of biomaterials, silk fibroin has attracted great attention due to its superior mechanical properties such as high stretchability, high strength, biocompatibility, as well as its biodegradability.[1] They can be made into various morphologies, for example hydrogels, sponges, films, etc., so as to facilitate their wide applications as medical textiles, surgical sutures, tissue engineering scaffolds, drug carriers, biosensors, etc. Recently, great efforts are demanded in order to understand and further enhance the mechanical properties of silk fibroin in terms of strength and toughness based on molecular level. In this study, largescale molecular dynamics simulations were carried out on silk crystalline and the interactions between nanomaterials and different domains of silk fibroin.[2,3] It was found that the mechanical properties of biomaterials could be tuned via hybrid with nanomaterials. These results provide in-depth understandings in molecular structure-mechanical property correlation in protein-nanomaterial interface, and will be providing a guideline to future design of bio-inspired materials for biomedical applications.[4]

Key Words: *Silk fibroin, Molecular dynamics simulation, Mechanical property.*

References

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