From basic principles of protein self-assembly to rational design of multifunctional fibers

Ulyana Shimanovich [1],

[1]Department of Materials and Interfaces, Weizmann Institute of science, Rehovot, 76100, Israel.

Ulyana.shimanovich@weizmann.ac.il

Self-assembly is the autonomous organization of components into patterns or structures without human intervention. A number of different assemblies can be formed by proteins. A particularly interesting example of protein self-assembly is a formation of highly ordered, nearly one-dimensional fibrilar structures. This high-level, long-range ordering is relatively independent of the molecular identity of the protein monomers. Interestingly, in nature, such structures can perform either beneficial roles or appear as aberrant protein aggregation, which is in a latter case results in the development of neurological disorders. The main objective of our research is to understand the evolution of protein complexes in the context of both biological function and malfunction as well as to draw the links between structure and properties of self-assembling materials based on natural polypeptides.

References

[1] Shimanovich, U. *et al.* Silk micrococoons for protein stabilisation and molecular encapsulation. *Nat. Commun.* **8**, (2017).

[2] Shimanovich, U. *et al.* Protein microgels from amyloid fibril networks. *ACS Nano* **9**, 43–51 (2015).

[3] Zhou, X. M. *et al.* Enzymatically Active Microgels from Self-Assembling Protein Nanofibrils for Microflow Chemistry. *ACS Nano* **9**, 5772–5781 (2015).

[4] Shimanovich, U., Song, Y., Brujic, J., Shum, H. C. & Knowles, T. P. J. Multiphase protein microgels. *Macromol. Biosci.* **15**, 501–508 (2015).

Song, Y. *et al.* Fabrication of fibrillosomes from droplets stabilized by protein nanofibrils at all-aqueous interfaces. *Nat. Commun.* **7**, (2016).

Figures

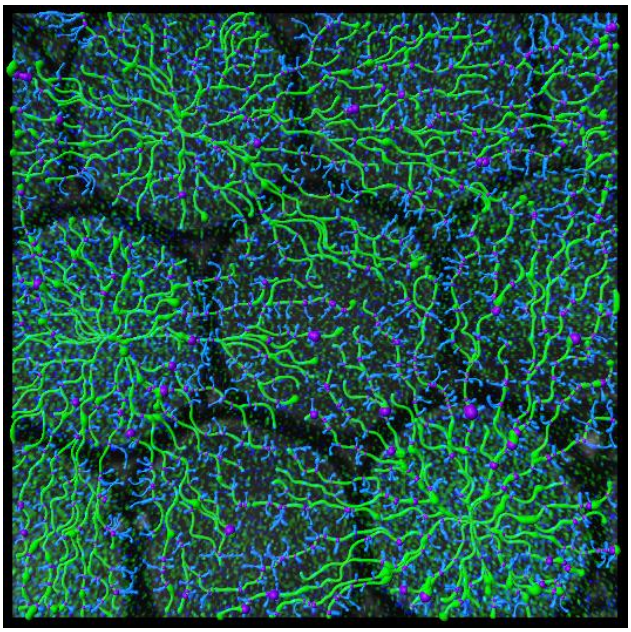

Figure 1. Microgels made of protein nanofibrils