Molecular Co-assembly of a Peptide/protein 3D Vessel for Bioengineering Applications

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Developing new bioinspired processes based on dynamic self-assembly could facilitate the fabrication of synthetic 3D materials with enhanced complexity, dynamic properties and functionality[1]. Nonetheless, the capacity to accurately control self-assembly of multiple building-blocks across scales with significant spatial and temporal control is still limited. Peptide Amphiphiles (PA)[2] and Elastin-Like Proteins (ELP) are molecularly designed building-blocks known to self-assemble into 3D nanostructures, with a well-known biocompatibility and stability that make them good candidates for dynamic self-assembly approaches.

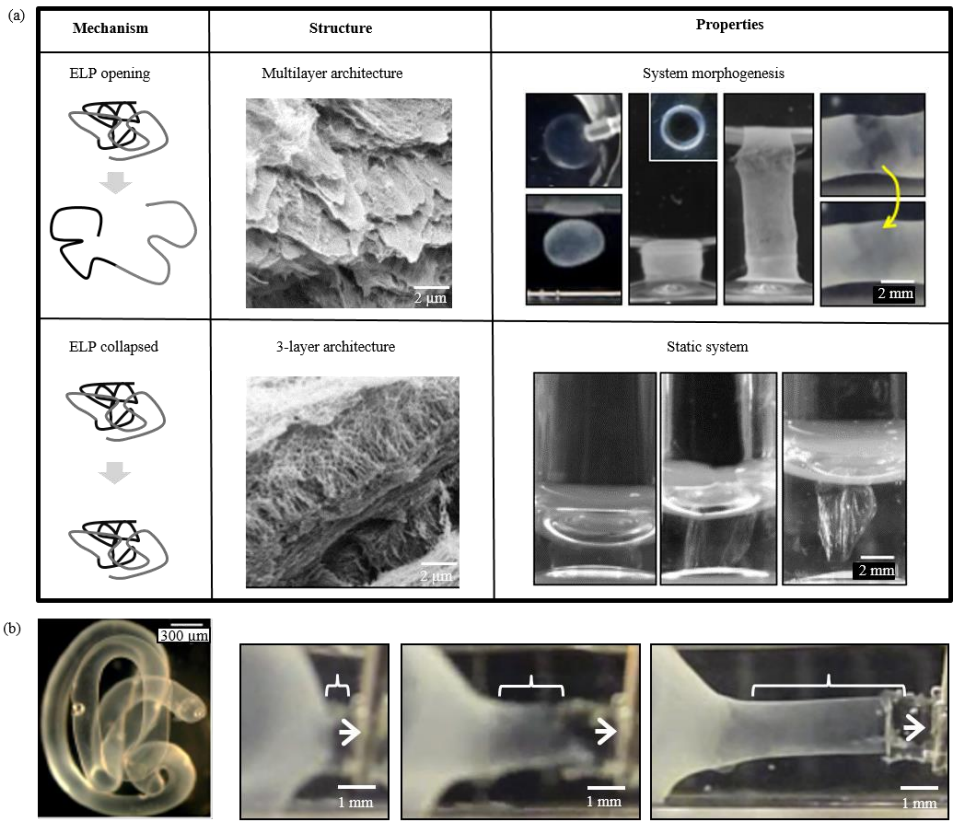

Figure 1. (a) Summary of the potential to generate a static or dynamic system based on the capacity to modulate ELP conformation at the molecular scale. (b) This system has the capacity to grow.

The interaction of ELP and PA molecules led to the fabrication of robust and dynamic tubular networks by directed self-assembly without the use of predefined moulds. The interfacial phenomena reported here may provide a novel fabrication platform for developing a new kind of hybrid peptide/protein nanomaterials of unprecedented complexity and functionality. The ability to modulate building-blocks molecules interactions at the nanoscale would represent a major break-through in nanomaterials and tissue engineering.

[1] G. M. Whitesides and B. Grzybowski, "Self-assembly at all scales.," *Science*, vol. 295, no. 5564, pp. 2418–21, Mar. 2002.

[2] R. M. Capito, H. S. Azevedo, Y. S. Velichko, A. Mata, and S. I. Stupp, "Self-assembly of large and small molecules into hierarchically ordered sacs and membranes.," *Science*, vol. 319, no. 5871, pp. 1812–6, Mar. 2008.