Contribution ID : **53** Type : **Oral**

Nano and Microstructure Investigation of Silk Fibroin-Based Hydrogels for Biomedical Applications: A Small Angle Scattering

Tuesday, 3 December 2019 10:45 (15)

Regenerated Bombyx mori silk fibroin (RSF) is a widely recognized protein for biomedical applications; however, its hierarchical gel structure is poorly understood. Here, the hierarchical structure of photocrosslinked RSF and RSF-based hybrid hydrogel systems: (i) RSF/Rec1-resilin and (ii) RSF/poly(N-vinylcaprolactam (PVCL) is reported for the first time using small-angle scattering (SAS) techniques [1]. The structure of RSF in dilute to concentrated solution to fabricated hydrogels were characterized using small angle X-ray scattering (SAXS), small angle neutron scattering (SANS) and ultra-small angle neutron scattering (USANS) techniques. The RSF hydrogel exhibited three distinctive structural characteristics: (i) a Porod region in the length scale of 2 to 3nm due to hydrophobic domains (containing β-sheets) which exhibits sharp interfaces with the amorphous matrix of the hydrogel and the solvent, (ii) a Guinier region in the length scale of 4 to 20nm due to hydrophilic domains (containing turns and random coil), and (iii) a Porod-like region in the length scale of few micrometers due to water pores/channels exhibiting fractal-like characteristics. Addition of Rec1-resilin or PVCL to RSF and subsequent crosslinking systematically increased the nanoscale size of hydrophobic and hydrophilic domains, whereas decreased the homogeneity of pore size distribution in the microscale. The presented results have implications on the fundamental understanding of the structure–property relationship of RSF-based hydrogels [1].

References

[1] J. L.Whittaker et al, International Journal of Biological Macromolecules 114 (2018) 998–1007.

Speakers Gender

Male

Travel Funding

No

Level of Expertise

Experienced Researcher

Do yo wish to take part in the poster slam

No

Primary author(s) : MATA, Jitendra (ANSTO); Dr WHITTAKER, Jasmin (University of South Australia); Dr BALU, Rajkamal (RMIT University); Dr KNOTT, Robert (Australian Centre for Neutron Scattering, ANSTO); Dr DE CAMPO, Liliana (Australian Centre for Neutron Scattering, Australian Nuclear Science and Technology Organization (ANSTO)); Dr REHM, Christine (GTIIT); HILL, Anita (CSIRO); Prof. DUTTA, Naba (RMIT University); Prof. CHOUDHURY, Namita (RMIT University)

Presenter(s) : MATA, Jitendra (ANSTO)

Session Classification : Session 14

Track Classification : Structural biology and biological systems