Joint Condensed Matter and Center for Soft Matter and Biological Physics Seminar

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"Protein Hydrogels from Marine Invertebrates: A Platform for Tunable Functionality"

Monday, October 7, 2019

4:00pm – 5:00pm

304 Robeson Hall

Sclerotized, proteinaceous structures in marine invertebrates are used for predation by facilitating grappling, piercing and tearing of prey. These structures must have robust mechanical properties that are tailored to the size, shape and function of the specific predatory tool. Two such structures are the squid sucker ring teeth (SRT) assembly and jaws from the North Atlantic sandworm, *Nereis virens*. Both structures are not mineralized and are primarily comprised of proteins. Intriguingly, these sclerotized acellular structures are formed in a constitutive marine environment without the benefit of evaporation to aid in removal of bulk water. We have studied this phenomenon in hydrogels created from two proteins, suckerin and Nvjp-1, derived from the squid SRT assembly and sandworm jaw, respectively. Upon exposure of the protein-based hydrogels to aqueous salt solutions, a significant decrease in hydrogel size occurs where bulk water is driven out and a condensation of the protein hydrogel occurs. Interestingly, the contraction rate as well as the mechanical properties of the condensed hydrogels are greatly dependent on the type of cation and anion present in the salt, and the trends differ among the two proteins. The final size and mechanical properties of the condensed structures is dependent on both the initial concentration of the hydrogels as well as the ions used for condensation. Together, the results suggest that spatially controlled casting densities coupled with a selective exposure to ions can create features in the final condensed structure with tunable mechanical properties, similar to what is observed in the marine organisms.

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