Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Soft hydrogel materials from elastomeric gluten-mimetic proteins

MEHRAN BAGHERI, University of Ottawa, SHANE SCOTT , McGill University, FAN WAN, SCOTT DICK, JAMES HARDEN, University of Ottawa, BIOMOLECULAR ASSEMBLIES TEAM — Elastomeric proteins are ubiquitous in both animal and plant tissues, where they are responsible for the elastic response and mechanical resilience of tissues. In addition to fundamental interest in the molecular origins of their elastic behaviour, this class of proteins has great potential for use in biomaterial applications. The structural and elastomeric properties of these proteins are thought to be controlled by a subtle balance between hydrophobic interactions and entropic effects, and in many cases their characteristic properties can be recapitulated by multi-block protein polymers formed from repeats of short, characteristic polypeptide motifs. We have developed biomimetic multi-block protein polymers based on variants of several elastomeric gluten consensus sequences. These proteins include constituents designed to maximize their solubility in aqueous solution and minimize the formation of extended secondary structure. Thus, they are examples of elastic intrinsically disordered proteins. In addition, the proteins have distributed tyrosine residues which allow for inter-molecular crosslinking to form hydrogel networks. In this talk, we present experimental and simulation studies of the molecular and materials properties of these proteins and their assemblies.

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Date submitted: 15 Nov 2013 Electronic form version 1.4