

Abstract Submitted
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Nonlinear elasticity of alginate gels SEYED MEYSAM HASHEM-NEJAD, SANTANU KUNDU, Mississippi State University — Alginate is a naturally occurring anionic polysaccharide extracted from brown algae. Because of biocompatibility, low toxicity, and simple gelation process, alginate gels are used in biomedical and food applications. Here, we report the rheological behavior of ionically crosslinked alginate gels, which are obtained by in situ gelation of alginates with calcium salts, in between two parallel plates of a rheometer. Strain stiffening behavior was captured using large amplitude oscillatory shear (LAOS) experiments. In addition, negative normal stress was observed for these gels, which has not been reported earlier for any polysaccharide networks. The magnitude of negative normal stress increases with applied strain and can exceed that of the shear stress at large strain. Rheological results fitted with a constitutive model that considers both stretching and bending of chains indicate that nonlinearity is likely related to the stretching of the chains between the crosslink junctions. The results provide an improved understanding of the deformation mechanism of ionically crosslinked alginate gel and the results will be important in developing synthetic extracellular matrix (ECM) from these materials.

Seyed Meysam Hashemnejad
Mississippi State University

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