Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Variability of Fiber Elastic Moduli in Composite Random Fiber Networks Makes the Network Softer EHSAN BAN, CATALIN PICU, Rensselaer Polytech Inst — Athermal fiber networks are assemblies of beams or trusses. They have been used to model mechanics of fibrous materials such as biopolymer gels and synthetic nonwovens. Elasticity of these networks has been studied in terms of various microstructural parameters such as the stiffness of their constituent fibers. In this work we investigate the elasticity of composite fiber networks made from fibers with moduli sampled from a distribution function. We use finite elements simulations to study networks made by 3D Voronoi and Delaunay tessellations. The resulting data collapse to power laws showing that variability in fiber stiffness makes fiber networks softer. We also support the findings by analytical arguments. Finally, we apply these results to a network with curved fibers to explain the dependence of the network's modulus on the variation of its structural parameters.

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Date submitted: 15 Nov 2014 Electronic form version 1.4