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A Novel 3D-Lattice Model of Fibrillar Polymeric Material
C. BRAD BENNETT, JAMES KRUCZEK, D.A. RABSON, W. GARRETT MATTHEWS, SAGAR A. PANDIT, University of South Florida — To elucidate a possible mechanism for simple material properties of fibrillar polymeric bulk material containing cross-links between constituent components, we introduce a 3D-lattice model that depends on cross-link number density (ρ) and the ratio (χ) of cross-link bond strength to thermal energy. The model predicts a phase transition in specific heat capacity occurring for χ between approximately 0.5 and 1.5, dependent on ρ. We present evidence that the properties of the represented phases are consistent with those of a solid phase and a liquid phase. These results indicate that variations in ρ or χ alone may provide a convenient basis for Nature to provide a range of material properties with limited resources.

Christopher Bennett
University of South Florida

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