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Strain recovery in dual cross-linked polymer grafted nanoparticle networks BALAJI IYER V S, VICTOR YASHIN, University of Pittsburgh, ISAAC SALIB, Intel, TOMASZ KOWALEWSKI, KRZYSTOF MATYJASZEWSKI, Carnegie Mellon University, ANNA BALAZS, University of Pittsburgh, ANNA BALAZS COLLABORATION, KRZYSTOF MATYJASZEWSKI COLLABORATION — Via computational modeling, we investigate the mechanism of strain-recovery in dual cross-linked polymer grafted nanoparticle networks. The individual nanoparticles are composed of a rigid core and a corona of grafted polymers that encompass reactive end groups. With the overlap of the coronas on adjacent particles, the reactive end groups form permanent or labile bonds, and thus form a "dual cross-linked" network. We consider the strain recovery of the material after it is allowed to relax from the application of the tensile force. We apply multiple cycles of tension and relaxation and determine how the stress-strain curves change in the course of these repetitive deformations. Notably, the existing labile bonds can break and new bonds can form in the course of deformation. Hence, a damaged material could be "rejuvenated" both in terms of the recovery of strain and the number of bonds, if the relaxation occurs over a sufficiently long time. We show that this rejuvenation depends on the fraction of permanent bonds, strength of labile bonds, and maximal strain.

Balaji
University of Pittsburgh

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