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Exploiting Dynamic Bonds in Polymer-grafted Nanoparticle Networks to Create Mechanomutable, Reconfigurable Composites ANNA C. BALAZS, MATTHEW J. HAMER, BALAJI V.S. IYER, VICTOR V. YASHIN, University of Pittsburgh — Via a new dynamic, three-dimensional computer model, we simulate the tensile deformation of polymer-grafted nanoparticles (PGNs) that are cross-linked by labile bonds, which can readily rupture and reform. For a range of relatively high strains, the network does not fail, but rather restructures into a stable, ordered structure. Within this network, the reshuffling of the labile bonds enables the formation of this new morphology. The studies reveal that the appropriate combination of stress-responsive hybrid materials and applied stress can yield distinct opportunities to dynamically switch between different structures, and thus, the properties of the material. Thus, the results provide guidelines for designing mechano-responsive hybrid materials that undergo controllable structural transitions through the application of applied forces.

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