Capturing dissipation and adhesion using transient network theory MICHELLE SING, GARETH MCKINLEY, BRADLEY OLSEN, Massachusetts Institute of Technology — Associative networks are prevalent in many fields and are of interest for applications where it is important that these materials are capable of adhering to their surroundings and/or provide a mechanism for dissipating energy in high-impact systems. However, little is known about the particular molecular behavior that differentiates these materials from their non-dissipative and non- adhesive associative counterparts. Here, we modify our previous work using the Smoluchowski equation to model the full network chain end-to-end distance distribution while tracking the population of individual chain conformations for chains that undergo multiple reaction intermediate steps. Thus, instead of the binary associated/dissociated states traditionally studied, we incorporate the ability for chains to partially dissociate and associate. This partial association/dissociation results in stress relaxation due to chain extension. In steady shear and start-up of steady shear, dissipation within the network becomes a function of both the elastically stored energy and the bond energy released during dissociation events.

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