

Abstract Submitted  
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**A direct comparison of crystallization transitions and glassy dynamics in polymers and colloids**<sup>1</sup> ROBERT S. HOY, COREY S. O'HERN, Yale University — Using computer simulations, we compare the freezing transitions in systems composed of  $N$  spherical particles with and without covalent-bonding constraints. Linear polymer chains with  $N - 1$  permanent covalent bonds are compared to “colloidal” systems with the same nonbonded interactions but no covalent bonds. In the “sticky hard sphere” limit, where covalent bonds act as holonomic constraints, the melting temperatures  $T_{\text{melt}}$  for both polymers and colloids (with the same  $N$ ) are inversely proportional to the number of unconstrained degrees of freedom. We also examine the effect of the thermal quench rate  $|\dot{T}|$  on collapse. At  $|\dot{T}|$  below a lower “critical” value, which decreases rapidly with increasing  $N$ , polymers and colloids form similar ground states. This critical value is lower for polymers than colloids and has different  $N$ -dependence. In both cases, the dynamics of the systems slow down near  $T_{\text{melt}}$  as the system approaches isostaticity. For high  $|\dot{T}|$ , glassy dynamics produces disordered final states. At intermediate  $|\dot{T}|$ , we find complex nonmonotonic behavior in  $T$ , which we relate to the very different rearrangement kinetics of polymeric and colloidal clusters.

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