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The topological structure of a network formed during simulations of a reversible polymeric gel M. WILSON, J. BILLEN, A. BALJON, SDSU, A. RABINOVITCH, Ben-Gurion U. of the Negev — We investigate the topologies of the ensemble of telechelic polymers for which we previously studied the sol/gel transition [1]. The polymers serve as "links" between "nodes," which consist of aggregates of their associating endgroups. The number of associations and hence the topology depends on the employed temperature. Our analysis shows that the degree distribution of the systems is bimodal and consists of two Poisson distributions with different average degrees <k>. Nodes in the distribution with the higher <k> we call "superpeers," those in the other distribution "peers." With decreasing temperature, the fraction of superpeer nodes increases. This increase is steepest at the "jamming" transition. The eigenvalue spectra of the networks reveal that in the jammed state peers are only connected to superpeers, a topology known to be very robust. By contrast, at high temperatures peers are connected to each other as well. Due to the finite size of the polymers, our telechelic networks differ from random Erdos-Renyi (ER) bimodal networks. As in many real-world networks, spatial effects play a role. After rewiring the networks obtained in the simulations, we reach the ER limit, that is, the clustering coefficients are equal to those obtained for random ER networks.
[1] JCP 126, 044907(2007)

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