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The Gelation Transition in Confinement: A Field-Theoretic Model and Mean-Field Solution ARUNA MOHAN, RICHARD ELLIOT, GLENN FREDRICKSON, University of California, Santa Barbara — Reactions among multifunctional monomers yield networks that may grow to macroscopic sizes, thereby resulting in a sol-gel phase transition. The classical Flory-Stockmayer theory of gelation relies on probabilistic arguments to calculate the percolation threshold leading to the formation of an infinite network. Subsequently, Gordon and coworkers reproduced the predictions of Flory-Stockmayer theory by employing statistical mechanical and graph theoretical methods (Gordon and Judd, Nature 1971). However, the description of inhomogeneous polymer networks, such as the formation of microphases during copolymerization, necessitates a field-theoretic model of network formation with account for all isomeric chain conformations. We present a field-theoretic model of reactions among multifunctional monomers, based on the approach of Gordon and coworkers. As an illustration of our model, we quantify the effect of one-dimensional confinement on the gelation transition via the numerical solution of the self-consistent field-theoretic equations.

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