Percolation and Diffusivity of Ideal Polymer Networks[1] YONG WU, BEATE SCHMITTMANN, ROYCE ZIA, Virginia Tech — We study the properties of ideal polymer networks both near and far from the percolation threshold. The polymers are modeled by non-interacting random walks on the bonds of a two-dimensional square lattice. We use numerical techniques to measure the percolation threshold and critical exponents of polymer networks for various polymer lengths. Further, we allow particles to diffuse by hopping over this quenched network of polymers. In particular, we measure the particle current in response to an externally imposed concentration gradient. When the system is far from percolation, we use the effective medium theory to predict its diffusivity and compare the results to the numerical simulation. An application of this study is the investigation of transport properties of gas molecules through thin polycarbonate films [Macromolecules 36, 8673, (2003)].

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