Density Fluctuations of Polymers in Disordered Media

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Phys. Rev. E **83**, 031801 (2011) DOI: 10.1103/PhysRevE.83.031801

In many experimental situations, linear polymers are present in a disordered medium, such as a free polymer chain inside an elastomeric network or a DNA molecule in an agarose gel. Using a lattice model, we study self-avoiding random walks in an environment where sites are excluded randomly, in two and three dimensions. For a single polymer chain, we study the statistics of the time-averaged monomer density and show that these are well described by multifractal statistics. This is true even far from the percolation transition of the disordered medium. We investigate solutions of chains in a disordered environment and show that the statistics cease to be multifractal beyond the screening length of the solution. The fact that the statistics of the average density are multifractal suggests that the dynamics are even more complex.

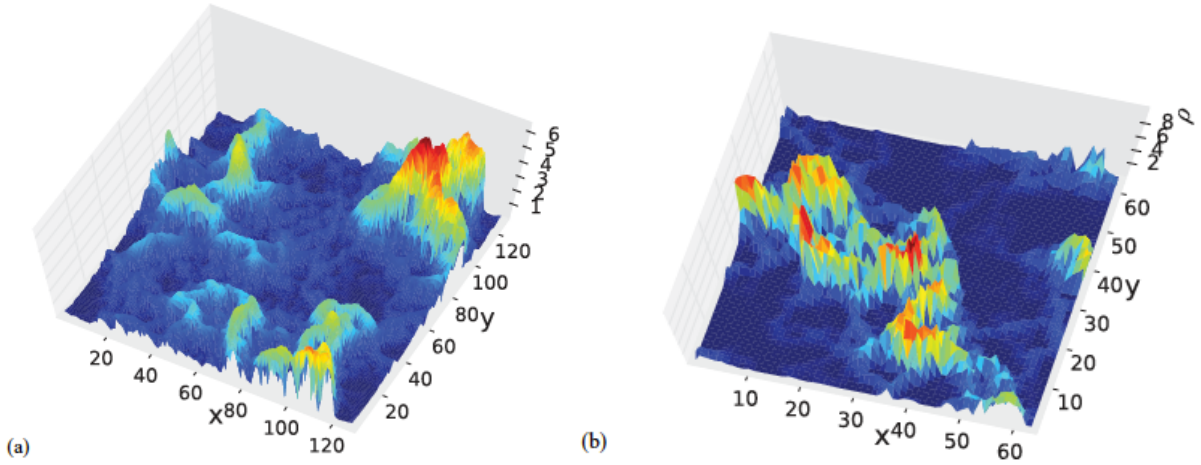

Figure. Time averaged monomer density ρ for a self-avoiding random walk in two dimensions: (a) N=512, L=128, n_0=0.1; (b) N=256, L=64, n_0=0.3. The horizontal axes are labeled x and y.

Supported by the Nonequilibrium Energy Research Center (NERC), which is an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under Award Number DE-SC0000989.