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Adsorption and collapse transitions of a linear polymer chain interacting with a surface adsorbed polymer chain

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Abstract

We study the problem of adsorption and collapse transition of a linear polymer chain situated in a fractal container represented by a four-simplex lattice and interacting with a surface-adsorbed linear polymer chain. The adsorbed chain monomers act as pinning sites for the polymer chain. This problem has been solved exactly using real space renormalization group transformation. The resulting phase diagram and critical exponents are given. © 2001 Published by Elsevier Science B.V.

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1. Introduction

The problem of surface effects on conformation statistics of long flexible polymer chains has been widely studied both because of its merit as an interesting problem in statistical mechanics and because of its important role in many physical processes like colloidal stabilization, adhesion, or lubrication, etc. [1,2]. The statistical mechanics approach to this problem has successfully been applied, particularly in case of a good solvent that contains only one linear polymer chain interacting with an impenetrable wall [3–8]. The essential physics is derived from a model of self-avoiding walk (SAW) on a semi-infinite lattice, with an energy contribution ε_a for each step of the walk along the lattice boundary. This leads to an increased probability characterized by the

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