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Abstract

A phenomenon that is exploited in material processing and also arises naturally in material systems is the confinement of a flexible elastic filament within a long, hollow tube and the potential transport of that filament along the length of the tube. The objective of the present paper is to describe the general nature of that confinement and to propose a physical model which can serve as a basis for extracting a quantitative estimate of the magnitude of a driving force for translation of the filament along the length of the confining tube. The focus is on fluctuations of a single filament confined to a planar motion within a tapered channel, including the prospect of fluctuations into the range of large deformation.

Keywords: filament confinement, statistical mechanics, reptation, partition function

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