

Abstract Submitted
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Characterizing knotting for polymers in tubes and nanochannels¹

CHRISTINE SOTEROS, NICHOLAS BEATON, JEREMY ENG, University of Saskatchewan — Motivated in part by experimental studies of DNA in viral capsids or in nanochannels, there is interest in understanding and characterizing the entanglement complexity of confined polymers. For this, one quantity of interest has been the “size” of the “knotted part” of a polymer. With such a measure, one can characterize knotting as “local”, when the size of the knotted part is small compared to the total length of the polymer, or otherwise “non-local”. One size measure is to associate knot-types to subarcs of a knotted polymer chain and use the arclength of the smallest knotted subarc as the knot-size. Using this, we study lattice models of polymers to explore the effects of confinement to a lattice tube on the likelihood of non-local versus local knotting. We classify knotted patterns as either non-local or local, depending on whether they can occur in a polygon in a non-local way or not. For an equilibrium model of ring polymers in a tube subject to a tensile force f , we prove results about the likelihood of occurrence of the two types of knotted patterns as a function of polymer length and provide evidence that non-local knot configurations are more likely than local ones, regardless of the strength or direction (stretching or compressing) of the force f .

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