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Theoretical Study of Tethered Polymers inside a Cylindrical Tube

TONGCHUAN SUO, MARK WHITMORE, Department of Physics and Astronomy, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada — We present a numerical self-consistent mean-field theoretical (SCMFT) study of polymer chains tethered to the inside walls of cylindrical tubes. We consider cases ranging from relatively thin to relatively thick tubes, from low to high tethering densities, and in various solvents. Our focus is on the polymer concentration profiles and the chain end distributions, in particular the concentrations and chain overlap at the tube centers. We show that these quantities depend primarily on only two parameters, and that this dependence becomes exact in the limit of low polymer concentration. We find that there can be significant polymer interpenetration at the tube centers even in cases where the tube radius is greater than the polymer R_{g}, and this can be tuned by changing the solvent quality and/or tethering density.

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