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Linearization of DNA by a squeezing flow in a tunable nanoscale tube: a simulation study MINSUB HAN, Incheon National University, BYOUNG CHOUL KIM, TOSHIKI MATSUOKA, SHUICHI TAKAYAMA, University of Michigan — Deoxyribose nucleic acid(DNA) is the biomaterial for storage of genetic information of all living organisms. The linearization of DNA is an initial step in one of the important methods to probe the vital information in biological and clinical settings. Squeezing the solution in flexible nanoscale channel proved to be a highly effective method for fully linearizing DNA (Toshiki et al. Nano Lett 2012). The detailed physical basis of the process is studied by using dissipative particle dynamics simulation, whose results corresponds to the lambda DNA in the nanoscale PDMS channel in the experiment. The squeezing process typically consists of a large degree of elongation by the advective flow, which is followed by recoiling back and adjusting to the narrower confinement. Strong gradient in advection and nanoscale confinement are thus the major thrust for the stretching in the process. The degree of the linearization also depends on the initial position relative to the center in the axial direction as well as the contour length.

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