عنوان مقاله:

Simulation of DNA Dielectrophoresis by Finite Element Method

محل انتشار:

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خلاصه مقاله:

Single molecule analysis of DNA has revealed new insights into its mechanical and physical properties. The study of stretching DNA is of significant interest to researchers and scientists in the fields of gene mapping. In this paper, DEP stretch of double stranded DNA (dsDNA) along the electric field lines is modeled by FEM. The 12-6 Lenard-Jones potential is used to describe the stacking energy. The geometry of dsDNAis initially assumed as the double helix dsDNA based on the helix function with 147bp. Backbones and base pairs are modeled as beam like elements. The force fields of the stacking and the hydrogen bond are added into the dsDNA model as the virtual beam elements. The experimental results of single-stranded DNA in phosphate buffer are chosen from literature to define the effective elastic modulus of clustered backbone andbase pair elements. The related voltage to each timeaveraged dielectrophoretic force value is calculated by DEP stretch formula. DNA stretch occurs as result of distributed force applied along the backbone of the molecule. A highly inhomogeneous stretching is observed in which near the free end there is very little stretching, while near the tethered end the tension is the sum of forces applied to the remainder of the chain. Numerical responses reveal an underlying scaling form for the extension of DNA versus applied voltage. .Outcomes obtained by FEM modeling are in goodagreement with experimental data

کلمات کلیدی:

DNA, dielectrophoresis, mechanicalproperties, finite element method