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Effect of Polymer Matrix on the Electrophoretic Mobility of Linear and Branched DNA in Polymer Solutions SOURAV SAHA, School of Chemical and Biomolecular Engineering, Cornell University, DANIEL HEUER, Department of Materials Science and Engineering, Cornell University, LYNDEN ARCHER, School of Chemical and Biomolecular Engineering, Cornell University — The electrophoretic mobility of linear T2 and 3-arm star branched DNA is studied in low polydispersity index linear polyacrylamide (LPA) solution of varying molecular weights in tris-acetate buffer. In semidilute solution (above the overlap concentration) we have found that the linear and the star-branched DNA of similar size have similar mobility below a certain threshold concentration. This threshold concentration is observed to increase with LPA molecular weight and correspond to about 10 blobs (hydrodynamic screening length) per polymer chain N/g. At concentrations below this threshold, the biased reptation with fluctuations model and constraint release could not explain the observed electrophoretic mobility dependence on LPA concentration and molecular weight, and the DNA mobility is found to be independent of the DNA conformation, sensitive to the ionic concentration and the electric field, and determined by the local non-Newtonian viscosity due to shear thinning of LPA in the electric double layer (EDL). Whereas above this threshold concentration, star branched DNA is found to have mobility lower than that of linear DNA and both the star branched and the linear DNA mobility are found to depend on the entanglements among polymer chains characterized by N/g.

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