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Nanopore detection of DNA molecules in crowded neutral polymer solutions[1] RAJESH KUMAR SHARMA, National University of Singapore, LIANG DAI, BioSystems and Micromechanics (BioSyM) IRG, Singapore-MIT Alliance for Research and Technology (SMART) Centre, 138602, Singapore, PATRICK DOYLE, BioSyM IRG, SMART Centre, Singapore; Department of Chemical Engineering, MIT, Cambridge, MA, USA, SLAVEN GARAJ, Department of Physics and Biomedical Engineering, National University of Singapore — Nanopore sensing is a precise technique for analysis of the structure and dynamics of individual biomolecules in different environments, and has even become a prominent technique for next-gen DNA sequencing. In the nanopore sensor, an individual DNA molecule is electrophoretically translocated through a single, nanometer-scaled pore in a solid-state membrane separating two chambers filled with electrolyte. The conformation of the molecule is deduced from modulations in the ionic current through the pore during the translocation event. Using nanopores, we investigated the dynamics of the DNA molecules in a crowded solution of neutral polymers of different sizes and concentrations. The translocation dynamics depends significantly on the size and concentration of the polymers, as different contributions to the electrophoretic and entropic forces on the DNA molecules come into play. This setup offers an excellent, tuneable model-system for probing biologically relevant questions regarding the behaviour of DNA molecules in highly confined and crowded environments.

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