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Threading of Binuclear Ruthenium Complex Through DNA Bases THAYAPARAN PARAMANATHAN, Department of Physics, Northeastern University, Boston, MA, USA., FREDRIK WESTERLUND, Nano-Science Center, University of Copenhagen, Copenhagen, Denmark., MICAH MCCAULEY, Department of Physics, Northeastern University, Boston, MA, USA., PER LINCOLN, Department of Chemical and Biological Engineering, Chalmers University of Technology, Goteborg, Sweden., IOULIA ROUZINA, Department of Biochemistry, Molecular Biology and Biophysics, University of Minnesota, Minneapolis, MN, USA., MARK WILLIAMS, Department of Physics, Northeastern University, Boston, MA, USA. — Due to steric constraints the dumb-bell shaped binuclear ruthenium complex can only intercalate DNA by threading, which requires local melting of the DNA to occur. By mechanically manipulating a single DNA molecule held with optical tweezers, we lower the barrier to threading compared to bulk experiments. Stretching single DNA molecules with different drug concentrations and holding a constant force allows the binding to reach equilibrium. We can obtain the equilibrium fractional ligand binding and length of DNA at saturation. Fitting these results yields quantitative measurements of the binding thermodynamics and kinetics. In addition, we obtain the minimum binding site size, which may be determined by either electrostatic repulsion or steric constraints.

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