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Electric-field driven translocation of colloidal wild and mutant fd viruses through a solid-state nanopore

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Research on DNA translocation through nanopore has drawn much attention because of its potential in DNA sequencing and biosensing. A lot of issues about translocation process have been found in recent years, such as capture kinetics, thermal fluctuations, electro-osmotic flow, etc. Due to the flexibility of DNA molecules, there are many complicated folded translocation events, which makes the task of data analysis difficult. Here we use semi-flexible fd virus particles as a model system for studying translocation dynamics. The fd particles have persistent length of $\sim$3 m, much larger than the diameter of a nanopore, making folded translocation unlikely. In our study, we can observe the subtle difference in their translocation dynamics of wild and mutant types of fd particles due to their different degrees of flexibility measured by their persistent lengths, fd at $\sim$3 μm and mutant Y21M at $\sim$10 μm. This work is done in collaboration with Anna Lu, Liping Liu, and Hongwen Wu in Sean Ling's group at Brown University.