**Video S2.** MD simulations comparing mobility of ID1 (top) vs ID6 (bottom) on an AcVES3 fiber. ID6 stays bound to the highly negatively charged region of the fiber, while ID1 is more mobile. The panels on the right show the real-time change in the center of mass for each ID during the course of the simulation, which is also shown in main text Figure 6C. Snapshots of initial and final time points are shown in main text Figure 6D.