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Dynamics of Simultaneous, Single Ion Transport through Two Single-Walled Carbon Nanotubes: Observation of a Three-State System STEVEN SHIMIZU, WONJOON CHOI, CHANG YOUNG LEE, MOON-HO HAM, MICHAEL STRANO, Massachusetts Institute of Technology — The ability to actively manipulate and transport single molecules in solution has the potential to revolutionize chemical synthesis and catalysis. In previous work, we developed a nanopore platform using the interior of a single-walled carbon nanotube (diameter = 1.5 nm) for the Coulter detection of single cations of Li+, K+, and Na+. We demonstrate that as a result of their fabrication, such systems have electrostatic barriers present at their ends that are generally asymmetric, allowing for the trapping of ions. We show that above this threshold bias, traversing the nanopore end is not rate-limiting and that the pore-blocking behavior of two parallel nanotubes follows an idealized Markov process with the electrical potential. Such nanopores may allow for high-throughput linear processing of molecules as new catalysts and separation devices.

Steven Shimizu
Massachusetts Institute of Technology

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