Abstract Submitted
for the SES20 Meeting of
The American Physical Society

Observing real time surface ligand exchange kinetics at the single nanocluster limit.[1] BOBBY COX, MADHAV GHIMIRE, MASSIMO BERTINO, JOSEPH REINER, Virginia Commonwealth Univ — Thiolate ligand capped water-soluble metallic clusters have become a key nanomaterial with applications in medical imaging and diagnostics. These clusters are coated with a monolayer of thiolate ligands to stabilize, prevent aggregation, and functionalize the particle. It is often of interest to perform ligand exchange after initial preparation of the particles for either further functionalization or as a diagnostic tool. Direct observation and characterization of the kinetics of ligand exchange at the single cluster limit has previously been difficult to achieve in an experimental setting due to the small size of the clusters ($D_c = 2$nm). Our group has now used resistive-pulse nanopore sensing to trap and monitor these clusters, and perform ligand exchange reactions on the trapped cluster while monitoring in real time. Once the cluster enters the pore and blocks the flow of ions through the pore, the ensuing current blockade confirms capture, and free ligands are allowed to access the cluster as it resides in the pore while we monitor the exchange reaction. Here we report our observation of rapid exchange on the order of seconds within the nanoconfined pore region, show that our results match calculated free energy profiles, and extend this to a proof of concept peptide sensor.

[1]This material is based upon work supported by the National Science Foundation under Grant CBET-2011173.

Bobby Cox
Virginia Commonwealth Univ

Date submitted: 19 Oct 2020 Electronic form version 1.4