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Enhanced single molecule mass spectrometry via gold nanoclusters

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Single molecule nanopore sensing is a powerful tool that has been used to characterize the size, charge and structure of various analyte molecules. The technique employs an electrophysiology apparatus that measures the current through a single isolated nanopore. Typical amplifier bandwidths for this system are limited to ca. 100 kHz. This means the analyte molecules must remain in the nanopore for extended periods (relative to nanometer diffusion times) in order to be detectable. Methods for increasing the analyte/nanopore interaction times have generally relied on modifications to the nanopore and/or analyte systems. I will describe a new, passive, method that employs single gold clusters protected with glutathione ligands ($\text{Au}_{25}\text{SG}_{18}$) that diffuse into and are trapped within the nanopore volume. These negatively charged clusters are both characterized by the nanopore and used to increase the interaction time of a test analyte molecule (polyethylene glycol (PEG)) within the nanopore/cluster region. Initial results indicate greater than an order of magnitude increase in PEG residence times within an alpha hemolysin nanopore. I will describe these results and discuss the implications for improving the nanopore SMMS methodology.