Plasmonic nanopores as nanotweezers

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Nanopores hold great potential for label-free investigation of single biomolecules, but often suffer from short dwell times of biomolecules in the sensor and hence limiting the precision at which physical properties from the analytes can be extracted. We propose here to extend these residence times by optically trapping the analyte inside the nanopore by use of an inverted bowtie plasmonic nanoatenna. The extreme light concentration in the nanoantenna provides high electromagnetic field gradients that can be used for optical nanotweezing and trapping of small objects. Moreover, the light transmission through this antenna allows for an alternative read-out of the trapped molecule that can complement the ionic current read-out. Here we demonstrate trapping of 20nm sized polystyrene beads inside an inverted plasmonic plasmonic nanoantenna. Current work focusses on trapping and investigating protein as to make the plasmonic nanopore a universal protein sensor.