

FUNCTIONALIZED NANOPIPETTES: A SENSITIVE TOOL FOR PATHOGEN DETECTION. Paolo Actis¹, Olufisayo Jejelowo², Nader Pourmand¹. actis@soe.ucsc.edu, jejelowo_oa@tsu.edu, pourmand@soe.ucsc.edu, 1 UC Santa Cruz 1156 High Street, MS SOE2, 95064 Santa Cruz, CA, 2 Texas Southern University, Dept. of Biology, 3100 Cleburne Street, 77004 Houston, TX

Introduction: Nanopipette technology is capable of detecting and functional analyzing biomolecules based on difference on their size, shape and electrical charge. This unique label-free biosensor is inexpensive, easy to fabricate and versatile. It gives a fast and real time output even in small reaction volume (attoliters). At this point, the nanopipette size and geometry, together with the surface chemistry preparation for attachment of a biomarker, antibody or protein probe was optimized by both experiments and modeling to result in detectable signals by the nanopipette. In this phase, the goal of the surface chemistry procedure was to prepare nanopipette tip in a way that only controlled amount of the surface is functionalized and used for probe attachment. Preliminary experiments are demonstrating the sensitivity and selectivity of the technique with specific proteins targeting HPV as well as environmental toxins. These results prove that nanopipettes functionalized with appropriate molecular recognition elements can be used as HPV/toxin sensors. A highly sensitive nanopipette probe can be precisely positioned, unlike other nanosensing technologies, at any subcellular region of a single living cell with submicron accuracy using a micromanipulator. This approach uses a movable sensor on an attached cell, in contrast to a fixed sensor detecting responses from floating cells. The functionalized nanopipette paves the way for in vivo immunoassay down to the single cell level.

References: [1] S. Umehara, N. Pourmand, C. D. Webb, R. W. Davis, K. Yasuda and M. Karhanek, *Nano Lett.*, **2006**, 6, 2486.

[2] S. Umehara, M. Karhanek, R. W. Davis and N. Pourmand, *PNAS*, **2009**, 106, 4611.

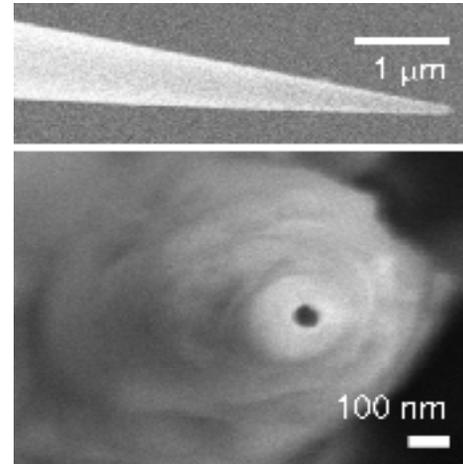


Fig. 1. SEM image of a nanopipette tip