

## Silicon nanowire Bio-FETs for Diabetes diagnostics

Walter Hu<sup>1,2</sup>, Serena Geene<sup>2</sup>, Michael Wallace<sup>1</sup>, Suresh Regonda<sup>1</sup>, Krutarth Trivedi<sup>1</sup>, Lisa Spurgin<sup>1</sup>, Bill Wu<sup>2</sup> and Jiahuan Ding<sup>2</sup>

<sup>1</sup>Dept. of Electrical Engineering, University of Texas, USA

<sup>2</sup>Diagtronix Inc., USA

Here we report a nano-enabled electronic biosensor for direct detection of biomarkers e.g. insulin down to 10 femtoMolar levels in human serum and saliva samples. First we present a design and fabrication of silicon nanowire field effect transistor (SiNW-FET) as biosensor. We use top-down strategy to fabricate silicon nanowire devices by the combination of photolithography and e-beam lithography on silicon on insulator wafers (SOI). The number of nanowires has shown a significant impact on the device performance, with better performance for larger number of nanowires used. We then test this type of sensor for medical diagnostic applications, such as insulin detection. Insulin is a diabetes related hormones and the quick detection of its level in blood is important for diagnosis of diabetes mellitus and also guiding its treatment. The traditional approaches for insulin quantification with mass spectra, ELISA or Western Blot etc are lack of sensitivity, time-consuming and/or requiring expensive equipments. Here we are using the SiNW FET devices to quantify the insulin level in human serum samples. Our preliminary sensing work has demonstrated repeatable detection of insulin directly from diluted patient serum without purification. The sensing experiments have repeatedly shown well correlated sensing of insulin with concentration from 10 femtoMolar (fM) to 1nM in pure PBS buffer and in human serum samples. We will demonstrate detailed sensing results related to diabetes disease in the meeting.

### Biography

Walter Hu received the B.S. degree from Peking University, Beijing, China, in 1999, and the Ph.D. degree from the University of Notre Dame, Notre Dame, IN, in 2004. Then, he spent a year as a post-doctoral research fellow at the Department of Electrical Engineering, University of Michigan, Ann Arbor, MI. In September 2005, he joined the University of Texas at Dallas and currently an associate professor of the Department of Electrical Engineering. His research has been focused on lithography, nanofabrication, and applications in semiconductors, medical and energy areas. He has published 37 journal papers and 69 conference abstracts/papers, and 4 patent applications. He has received National Science Foundation's CAREER award in 2010. He is a member of Sigma Xi, IEEE, AVS, MRS, ACS, and SPIE.

wxh051000@utdallas.edu