

# Digital Patterning of Glucose Oxidase for Electrochemical Glucose Biosensors

G.S. Herman<sup>1</sup>, C. Durgan<sup>1</sup>, X. Du<sup>1</sup>, L. Arnadottir<sup>1</sup>,  
D. Matthews<sup>2</sup>, T. Klarr<sup>2</sup>, S. Kundu<sup>2</sup>, J.F. Conley, Jr.<sup>2</sup>  
K. Ward<sup>3</sup>, R. Cargill<sup>3</sup>, J. Castle<sup>3</sup>, P. Jacobs<sup>3</sup>

<sup>1</sup>Oregon State University, School of Chemical, Biological, and Environmental Engineering, Corvallis, OR

<sup>2</sup>Oregon State University, School of Electrical Engineering and Computer Science, Corvallis, OR

<sup>3</sup>Pacific Diabetes Technologies, Portland, OR

## Abstract

Type 1 diabetes is a pancreatic disease that afflicts over one million people in the United States. Patients with type 1 diabetes are not able to produce their own insulin and must use portable blood glucose monitors to measure glucose levels, and have insulin delivered by injection or pump. Glucose monitoring in the subcutaneous tissue closely parallels the blood glucose values, and allows patients to be alerted to hypoglycemia and hyperglycemia conditions. We are using electrohydrodynamic (e-jet) printing to pattern glucose oxidase on flexible amperometric glucose sensors. E-jet printing is of interest for these sensors since printing of features down to 200 nm has previously been demonstrated, while e-jet printing also allows significant flexibility in the digital patterning of glucose enzyme electrodes on either rigid or flexible substrates in a variety of sizes and shapes. In this presentation we will discuss glucose oxidase ink formulation, surface pretreatment conditions, and electrochemical characterization of the printed glucose enzyme electrodes.

## Biography

**GREGORY S. HERMAN** received his B.S. degree in Chemistry at the University of Wisconsin-Parkside in 1985 and his PhD. in Physical Chemistry at the University of Hawaii at Manoa in 1992. In 1992 Gregory received a National Research Council Postdoctoral Fellowship at the Naval Research Laboratory and performed research at the National Synchrotron Light Source at Brookhaven National Laboratory. Later in 1992 he began a second postdoctoral fellowship at Pacific Northwest National Laboratory (PNNL). From 1995 until 2000 Gregory was a senior research scientist in the Environmental Molecular Sciences Laboratory at PNNL. From 2001 until 2007 he was an R&D engineer in the Advanced Materials and Processes Laboratory at Hewlett-Packard Corporation. From 2007 until 2009 he was a senior scientist in the Materials and Device Applications Laboratory at Sharp Laboratories of America. In 2009 he joined the School of Chemical, Biological and Environmental Engineering at Oregon State University (OSU) as an Associate Professor. Currently Gregory is also Associate Director of the Oregon Process Innovation Center for Sustainable Solar Cell Manufacturing.