Wearable Contact Lens Biosensors for Continuous Glucose Monitoring using Smartphones

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Lens cross-section study

The cross-section of the glucose sensor has been measured under the microscope *versus* glucose concentrations in the range of 10-100 mM to confirm that the correlation above 50 mM was nonlinear similar to the relation between the glucose concentration and the sensor's periodic constant.

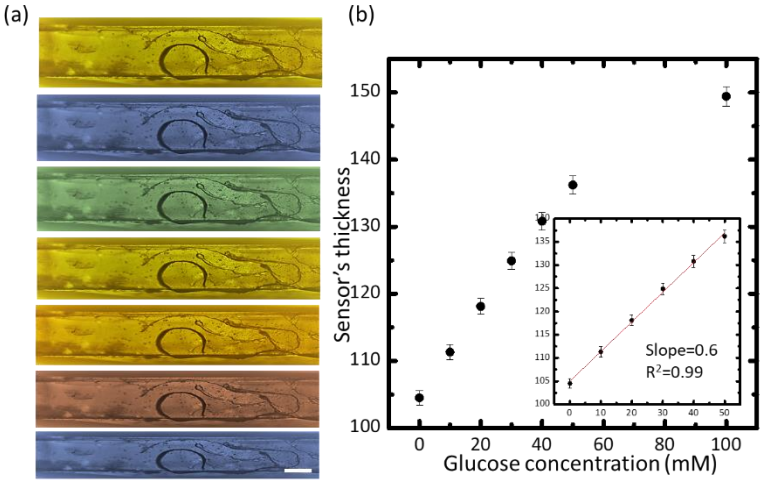

Figure S1. (a) Microscopic images of the 1D-PS sensor's cross-section in various glucose concentrations, (b) Change in the sensor's cross-section as function of glucose concentration. The scale bars show standard error (n=3).

Sensor swelling with different glucose concentrations

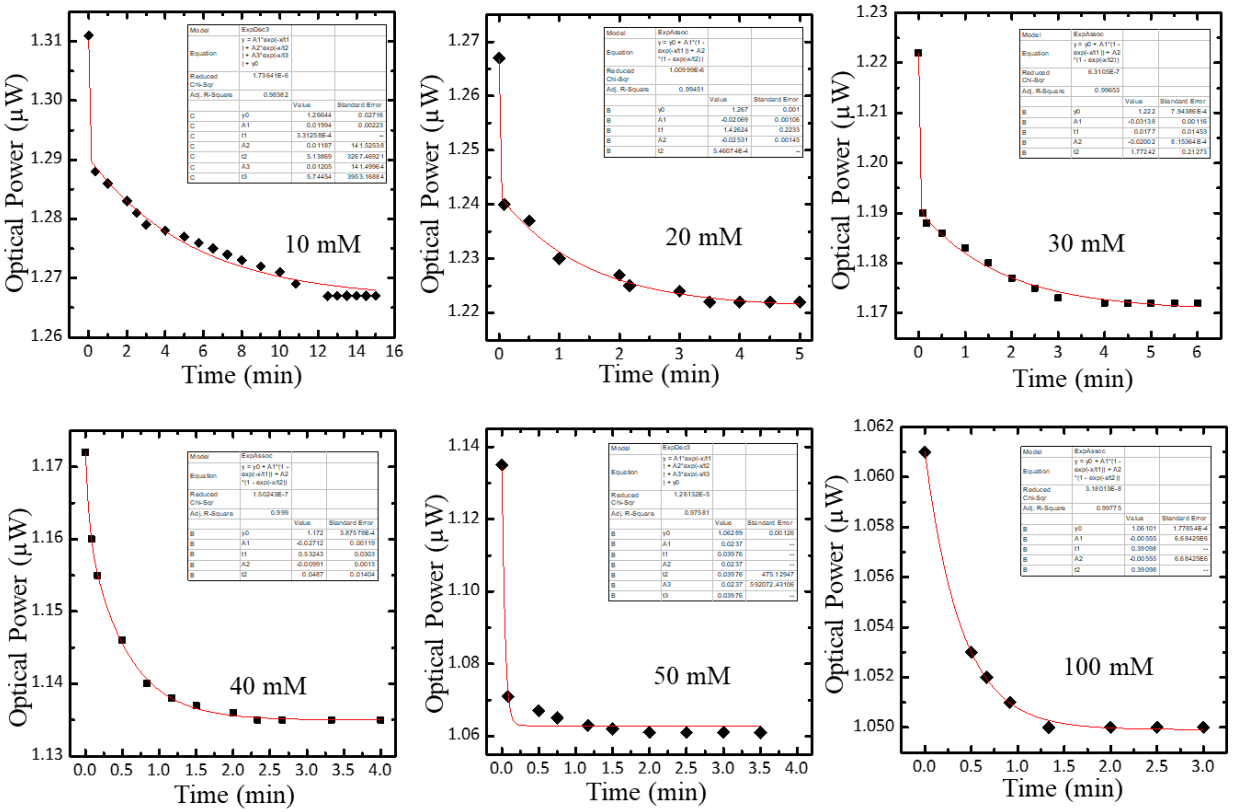

Figure S2. The kinetic swelling of the contact lens attached sensor in different glucose concentrations from 10 to 100 mM in continuous monitoring mode.

Strain testing of the sensor

A new experiment has been conducted to study the effect of the mechanical strain on the output signal of the contact lens sensor. The contact lens attached with the photonic sensor was exposed to an extension force and the change in the output signal was recorded by a power meter. The mechanical strain was monitored *against* the reflected power in the first- order spot. It has been found that the slight change in the mechanical strain of 2.2% caused change in the output signal

with 3%. In our previous study it was found that increasing the glucose concentration from 0 to 50 mM led to the decreased output power by around 20%, as the power decreased from 1.31 to 1.05 µW. Therefore, 2.2% change from the mechanical strain caused an interference in the output reading with 13% when the sensor monitoring glucose concentration of 50 mM. This interference percentage is expected to significantly increase if the sensor was working on monitoring lower glucose concentrations for example, for 10 mM glucose concentration the interference is expected to be around 40%. Therefore, the sensor is not recommended for people who suffer from the diseases that continuously change the intraocular eye pressure.

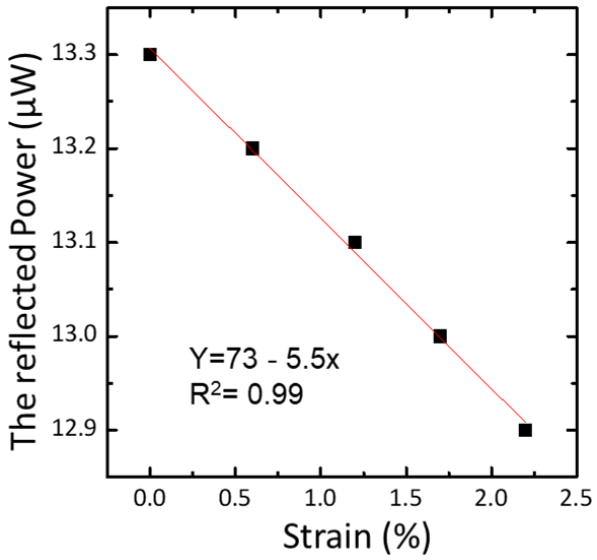

Figure S3. The reflected power from the contact lens sensor versus the change in strain.