Potentiometric Glucose Biosensor
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Glucose metabolism is a fundamental difference between normal and cancerous cells. Therefore, quantifying the concentration of glucose within cells can be an important step in cancer prevention and treatment. Potentiometry will pass a significantly lower amount of charge into the cell compared to other electrochemical techniques, minimizing perturbation to cellular homeostasis. We have fabricated potentiometric glucose sensors by immobilizing glucose oxidase on an electrode surface within a chitosan hydrogel. Then, a protective layer of Nafion was drop cast onto the electrode surface. These sensors can detect a change in potential as a function of glucose concentration. Here, we demonstrate the use of our potentiometric sensors in a complex matrix by supplementing no glucose cell media with known concentrations of glucose to generate a calibration curve. Next, the concentration of glucose in manufactured Dulbecco’s Modified Eagle’s Media (DMEM)-high glucose was quantified. Finally, we miniaturized our potentiometric sensors from macro- and micro-electrodes down to nano-electrodes using laser-assisted fabrication for future intracellular studies. These nano-sensors will undergo further optimization before they can be used to quantify glucose in spheroids and single cells, both healthy and cancerous.