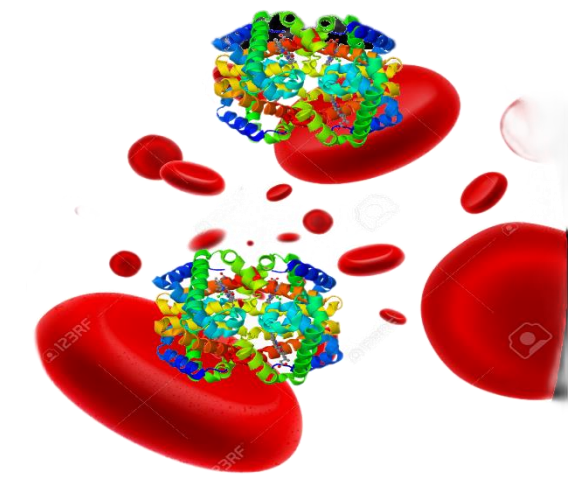


MOTIVATION

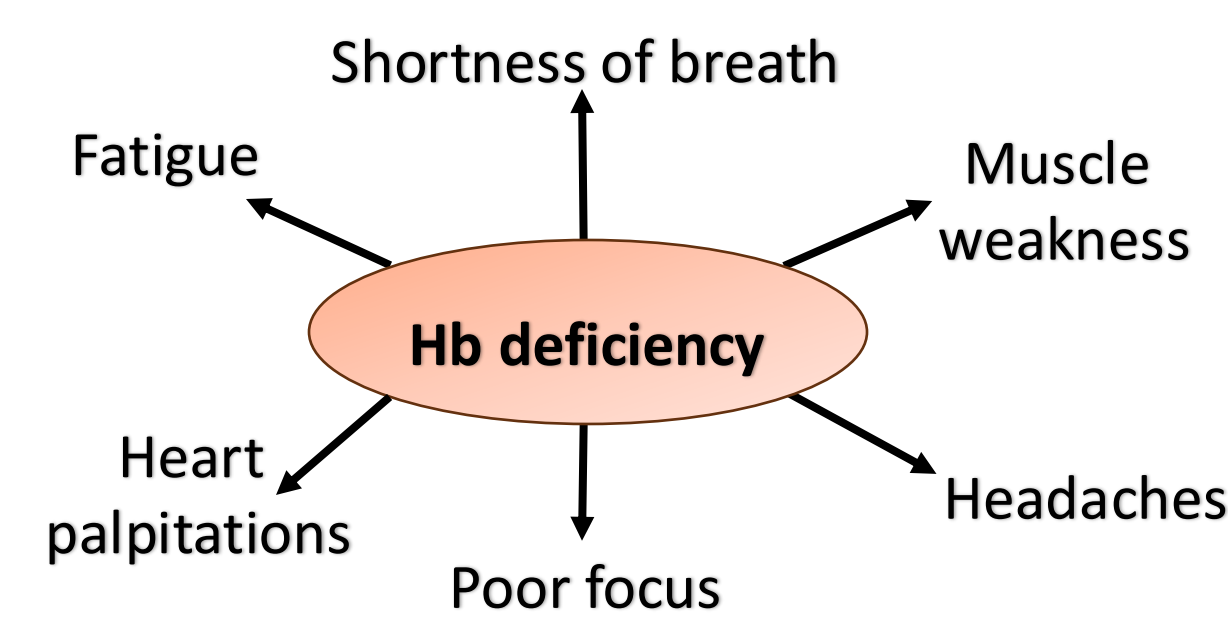
Hemoglobin (Hb): Vital protein for oxygen transport in blood.



Hemoglobin inside red blood cells

Why Hb detection? Hb is a biological marker to diagnose various diseases.

Hemoglobin (Hb) disorders symptoms



Total Volume: 0.5 mL

β mL amount of Phosphate Buffer

α amount of 1.00E-3 M Solution

BACKGROUND

Photovoltaic (PV) devices create an electric current when illuminated. This current depends on the incoming illumination.

Hypothesis: Use the intrinsic characteristics of solar cells to obtain a highly sensitive and reliable measurement of current (I) at specific hemoglobin concentrations (M).

Experimental Testing: Analyzing current-voltage characteristic (I-V) curve characteristic of PVs in the presence of different concentrations (M) of Hb, from 10⁻⁸ to 10⁻³ mol.

Beer-Lambert law: Absorption = -Log(I/I₀)

OBJECTIVES

Characterization of commercially available and in-lab fabricated photodetectors

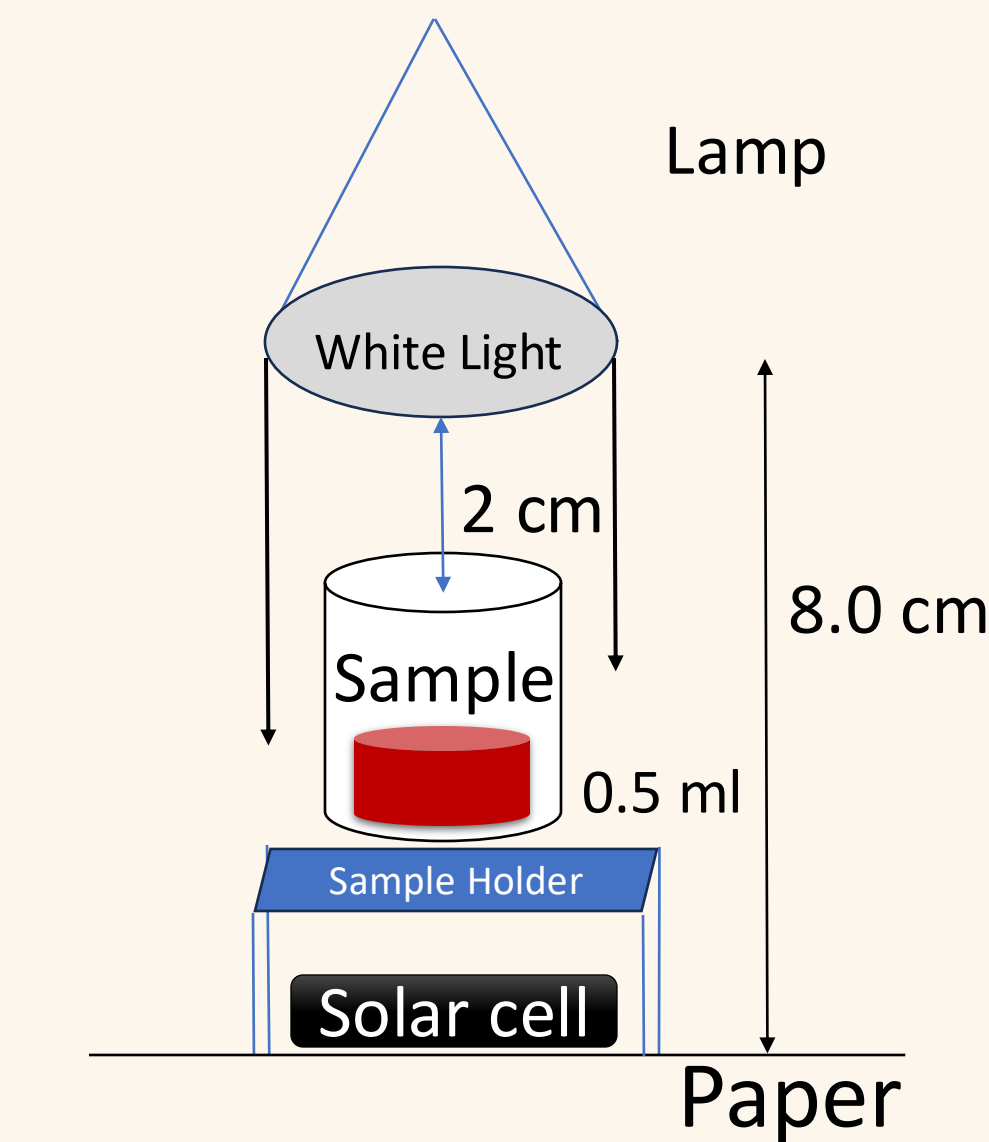
Collection of current measurements to determine Hb concentration in samples

Long term Objective :

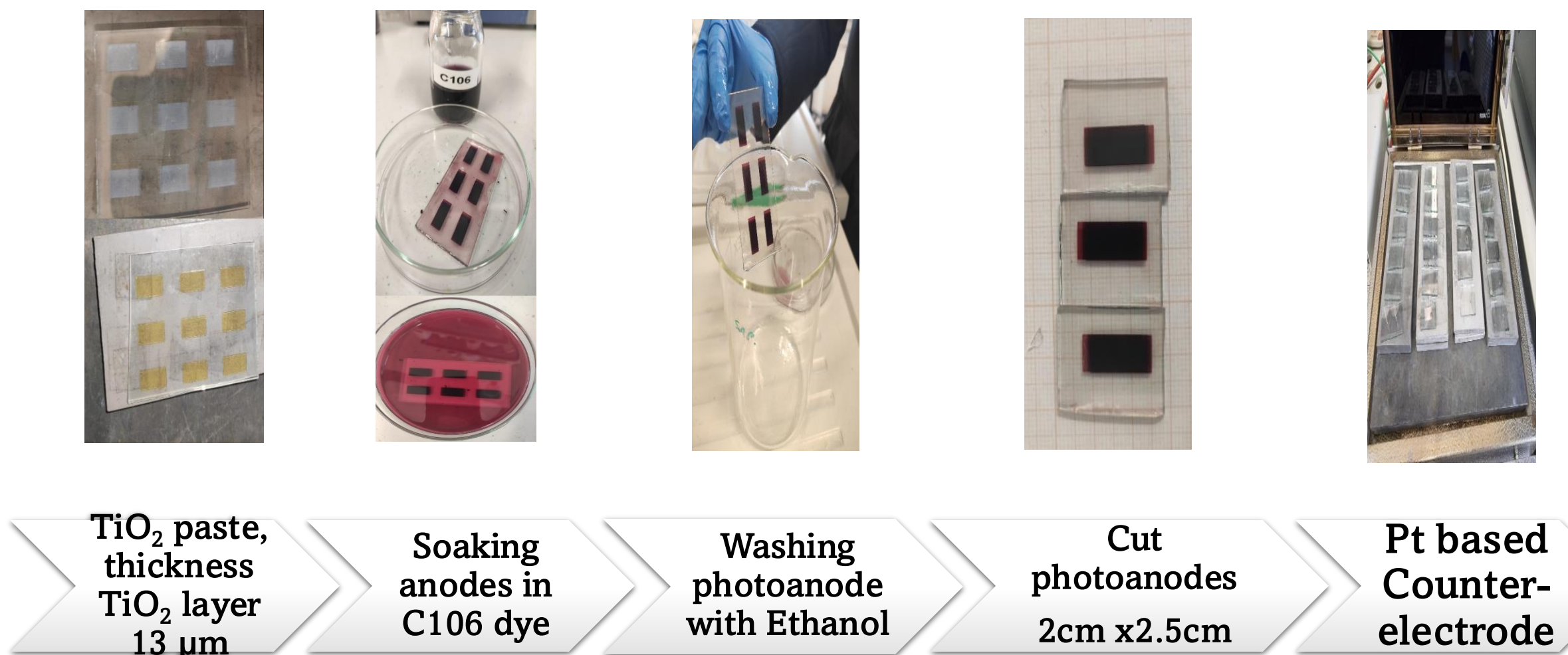
Development of the pinprick Hb sensor

APPROACH

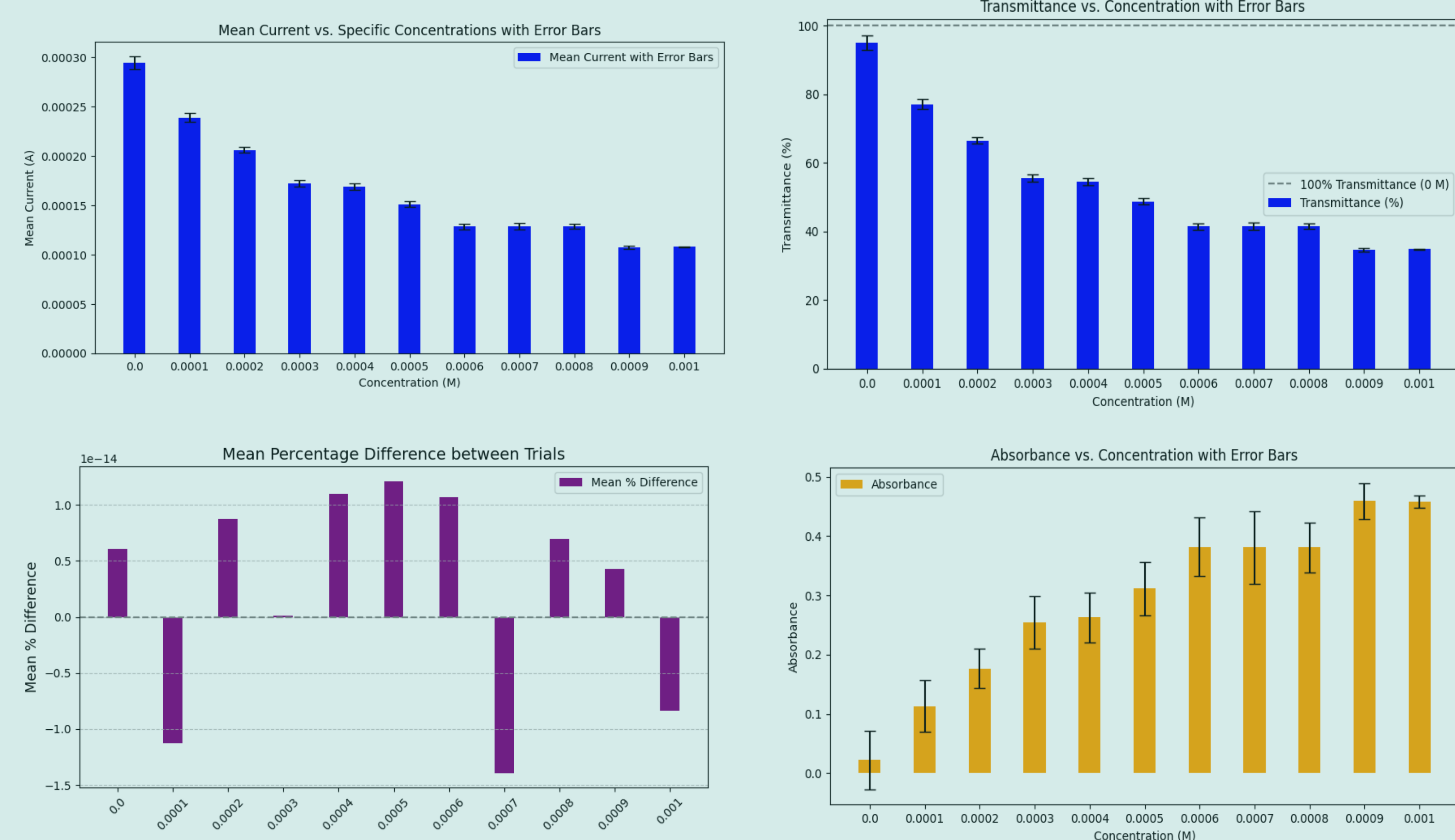
Quantitative current measurement under different concentrations of Hb
Key Features: Short circuit current (I_{sc}). Absorption.



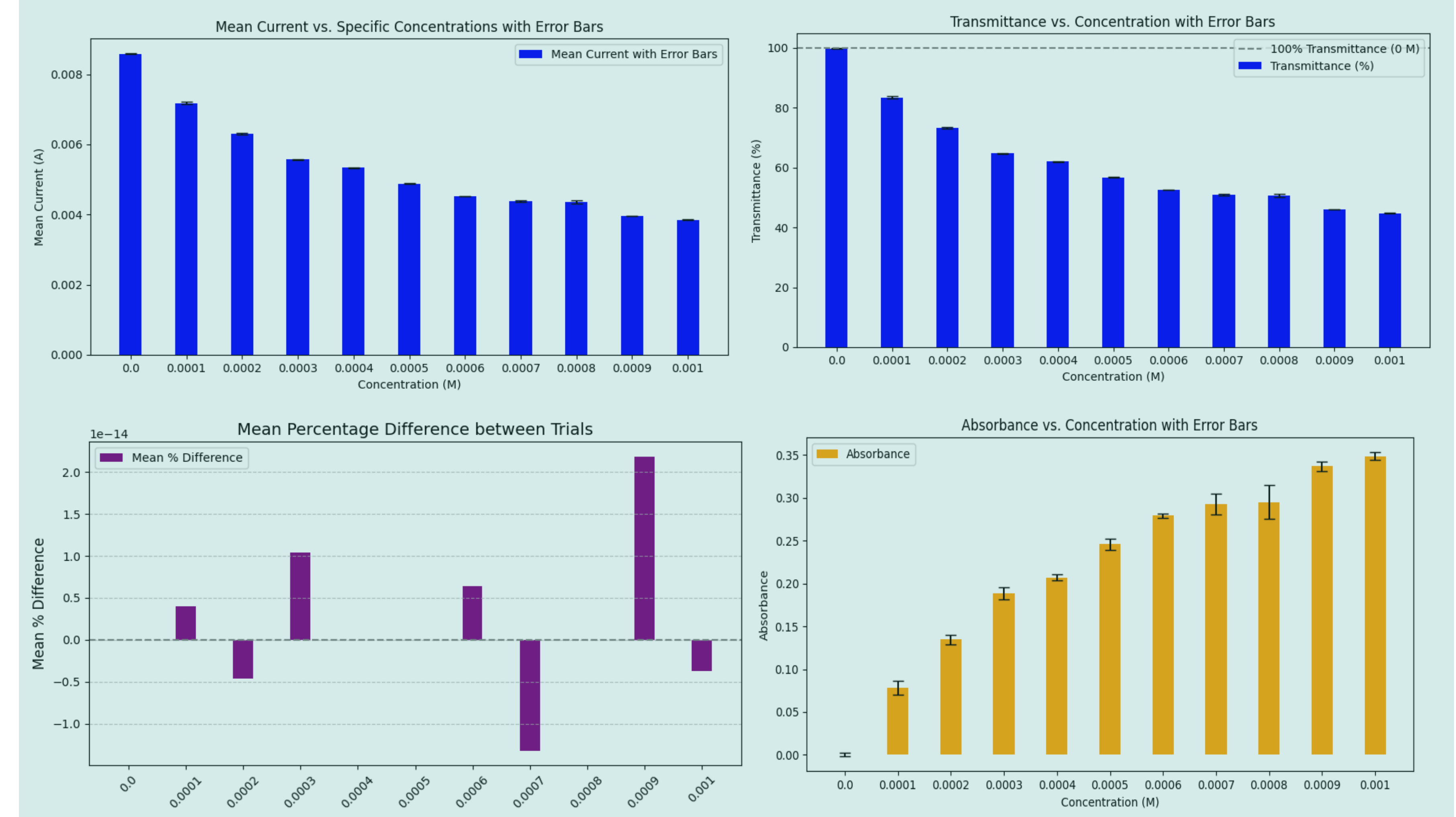
FABRICATION OF DYE SENSITIZED SOLAR CELLS (DSSC)s



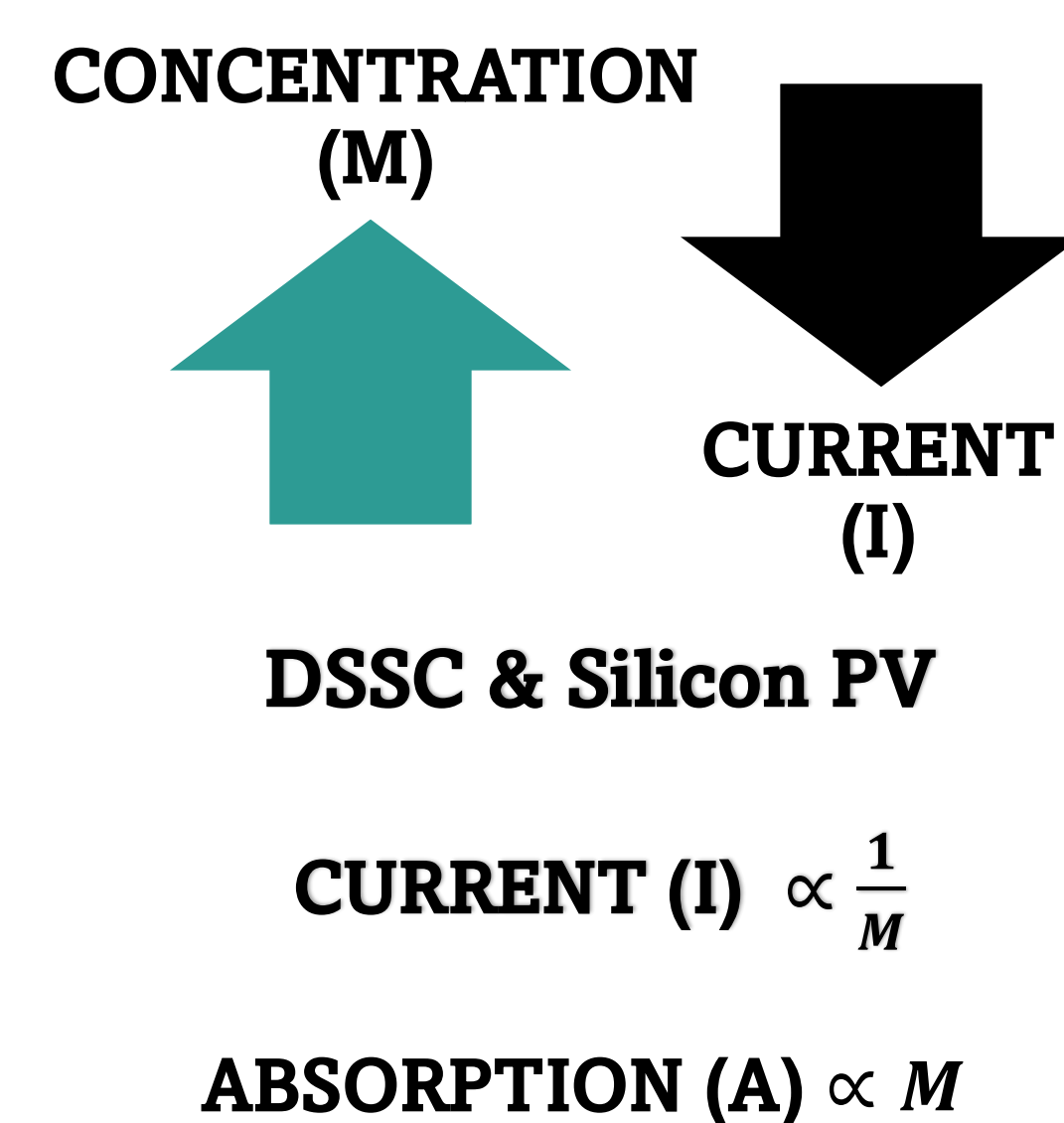
I-V PRELIMINARY RESULTS – DSSC



I-V PRELIMINARY RESULTS – Monocrystalline silicon PV



ANALYSIS AND KEY FINDINGS



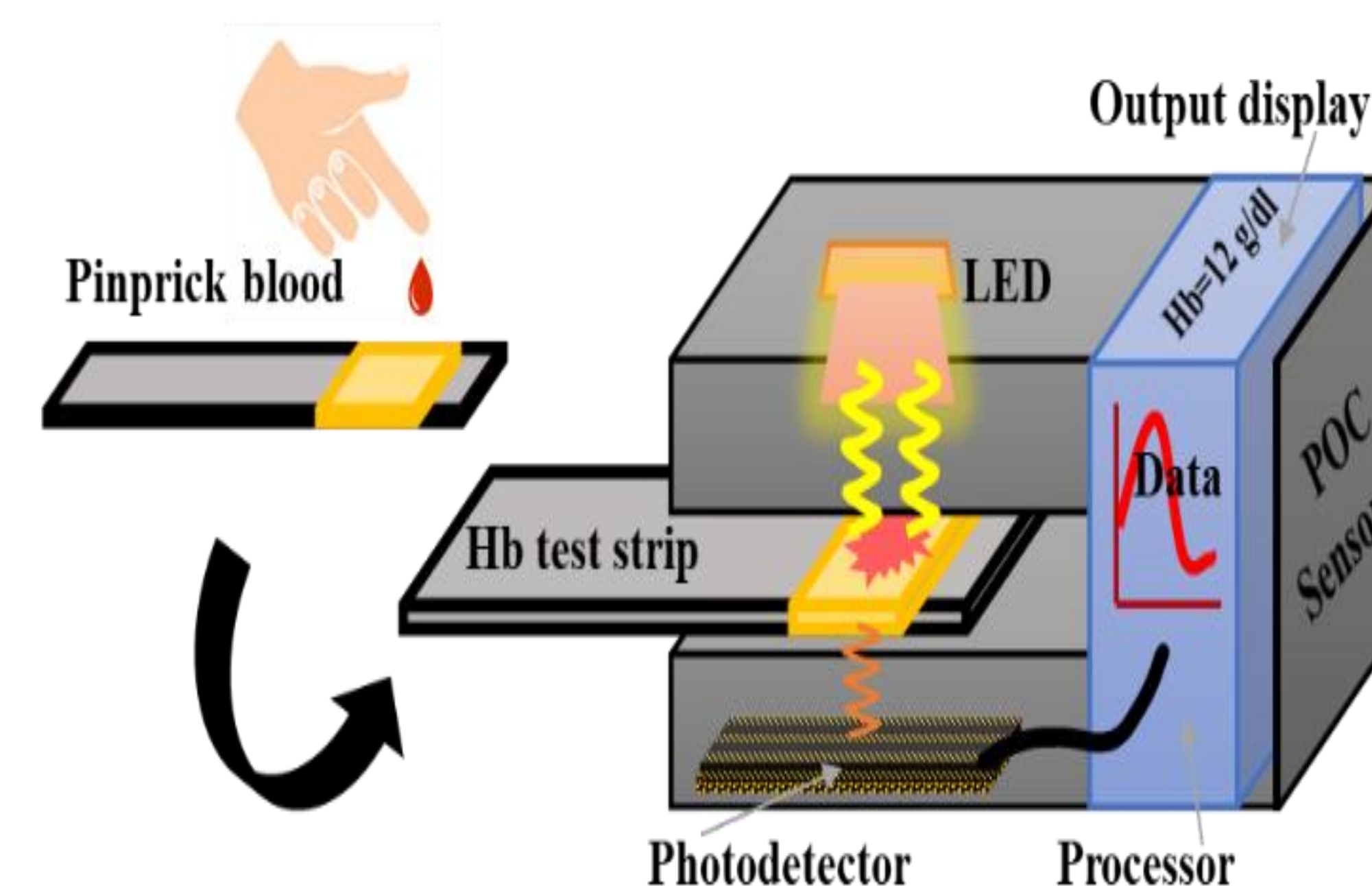
FUTURE WORK

Measure limit of detection for hemoglobin concentrations with different types of PVs.

Optimization of transmission light based on the interaction between ligand and Hb on the test strip.

Use monochromator to test current response of solar cells under different wavelengths

PINPRICK Hb SENSOR



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ACKNOWLEDGEMENTS

Ontario Tech University acknowledges the lands and people of the Mississaugas of Scugog Island First Nation.

We acknowledge the support of the Natural Sciences and Engineering Research Council of Canada (NSERC). MITACS. And the help of my lab research group.

