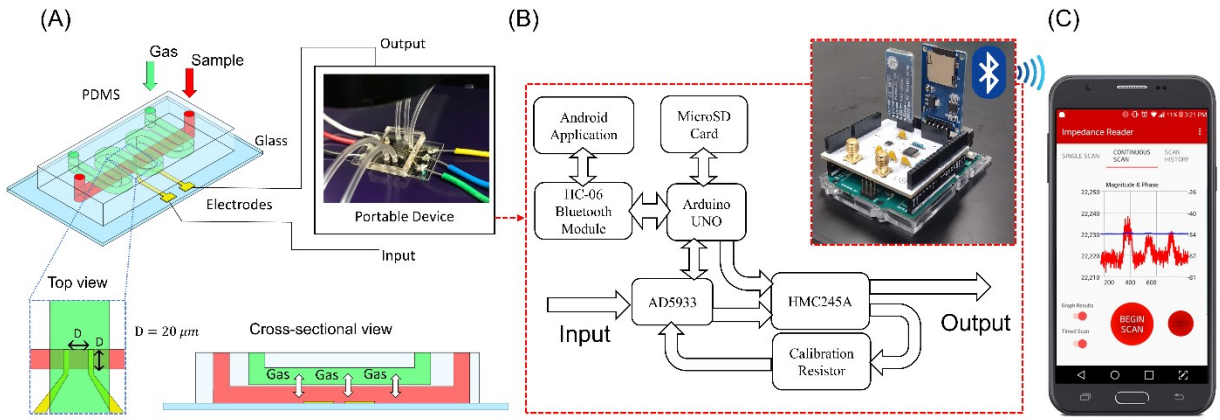

Figure 1. Device overview of the portable impedance-based flow cytometer prototype. (A) A double layer PDMS device bonded to a glass substrate patterned with Ti/Au electrodes. The electrodes provide connectivity to the portable device. The top view shows the intersection of the gas channel over the point of measurement between the electrodes. The cross-sectional view depicts the gas exchange between two channels to induce cell sickling. (B) The flow chart of the portable device consisting of all major components used and how information moves between the components. (C) The Android application used to control the portable device operated to continuously scan for a designated length of time and produce a graph of the results.

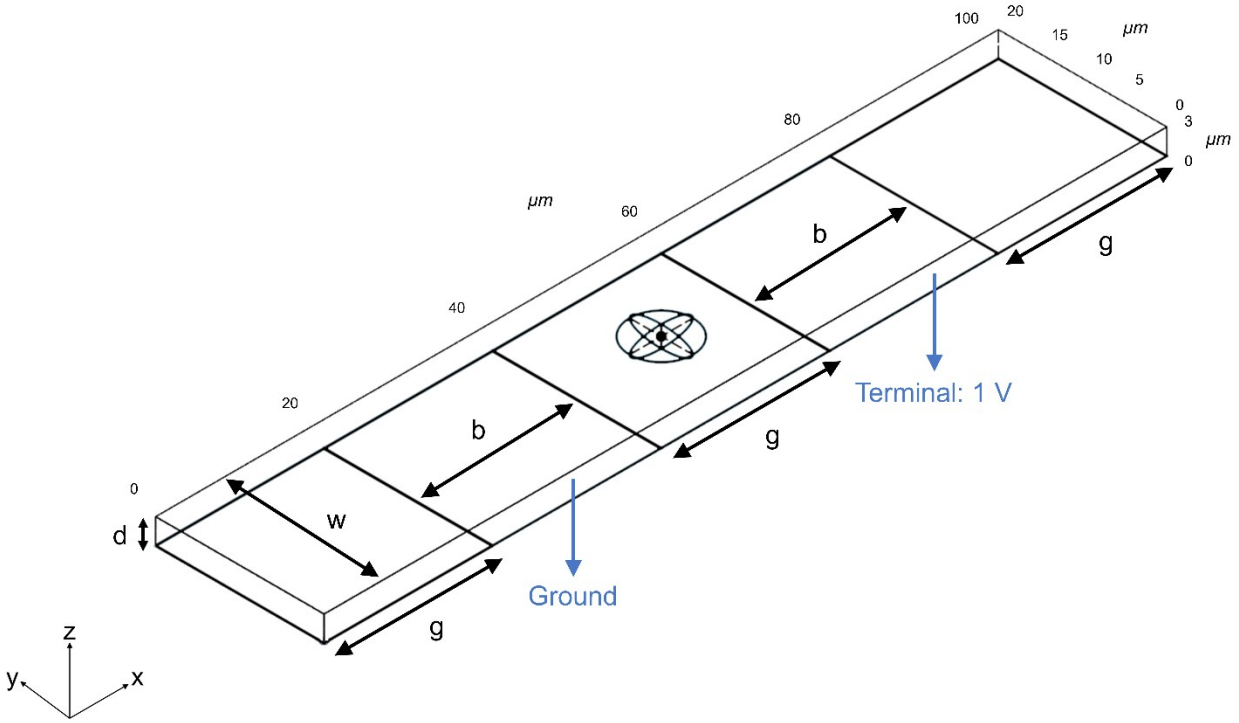

Figure 2. Computational domain and boundary conditions for finite element modeling of PBS impedance.

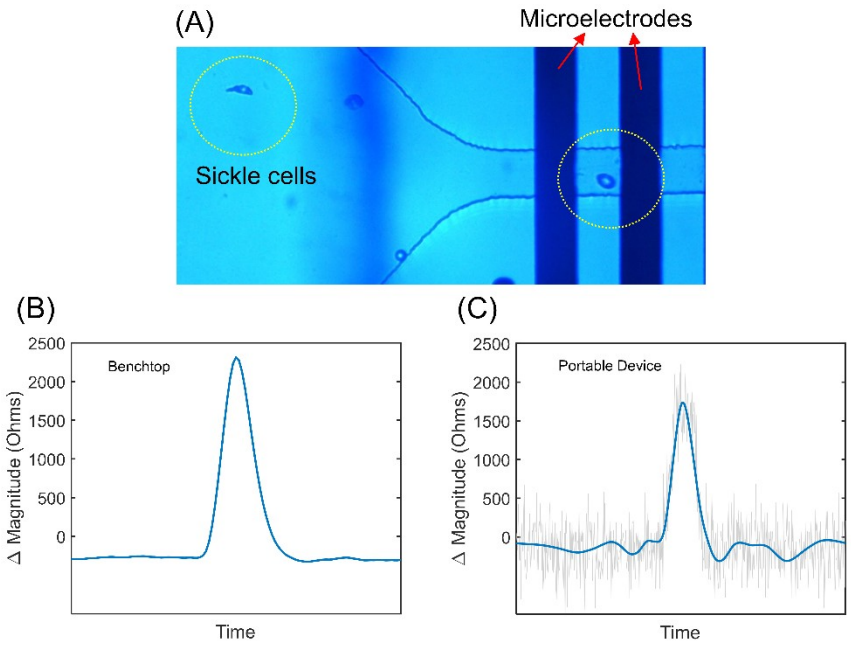

Figure 3. (A) Representative microscopic image of RBCs under hypoxia travelling through the microfluidic channel to be measured between two microelectrodes. (B) The impedance magnitude response of a single cell passing through the microelectrode pair using the HF2IS. (C) The impedance magnitude response of a single cell passing through the microelectrode pair using the portable device. The gray signal is the raw response recorded. The blue signal is result of passing the raw response through a level 3 wavelet filter with BlockJS denoising in MATLAB.

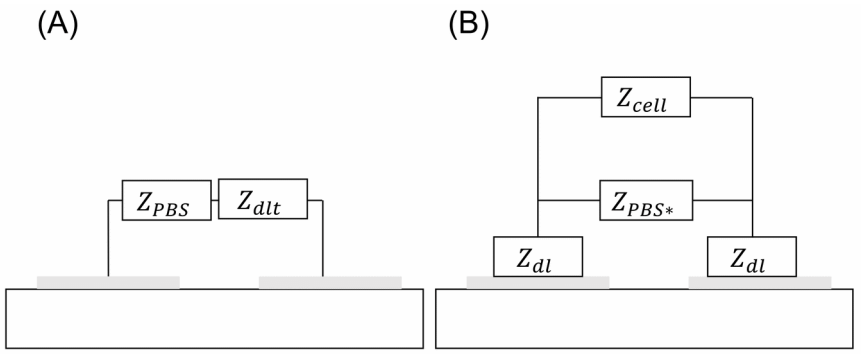

Figure 4. (A) The impedance circuit model when a cell is not present. Z_{dlt} refers to the total double layer impedance. Z_{PBS} represents the impedance of the PBS when no cell is being measured. (B) An impedance circuit model of an RBC in the PBS medium between two electrodes. Z_{dl} represents the double layer impedance where the electrodes meet the PBS. $Z_{PBS*¿¿}$ and Z_{cell} are the impedance of the PBS while a cell is present in the channel and the measured RBC, respectfully.

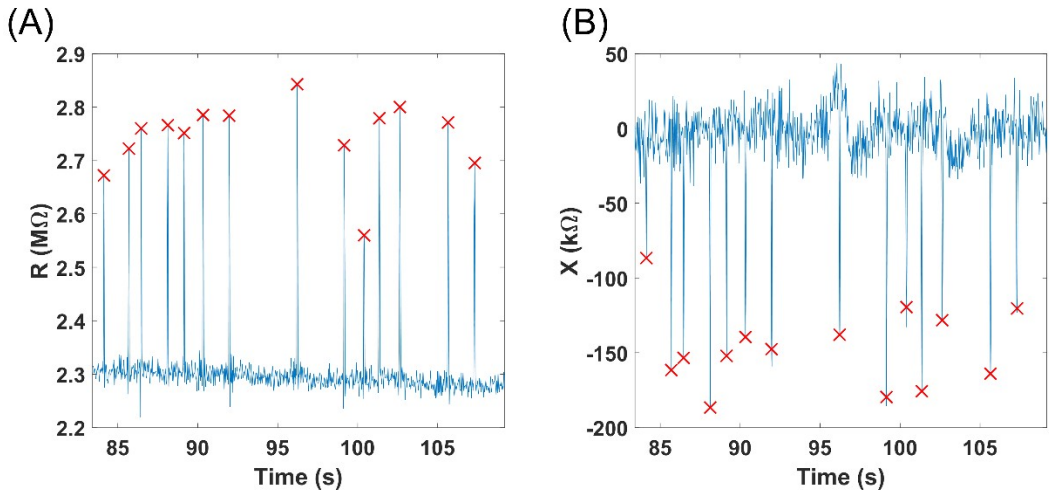

Figure 5. (A) A MATLAB algorithm is used to identify fourteen peaks from the real part of the calculated cell impedance results obtained from the portable device using a minimum threshold. (B) The corresponding imaginary values were obtained by matching the time coordinate from the real plot.

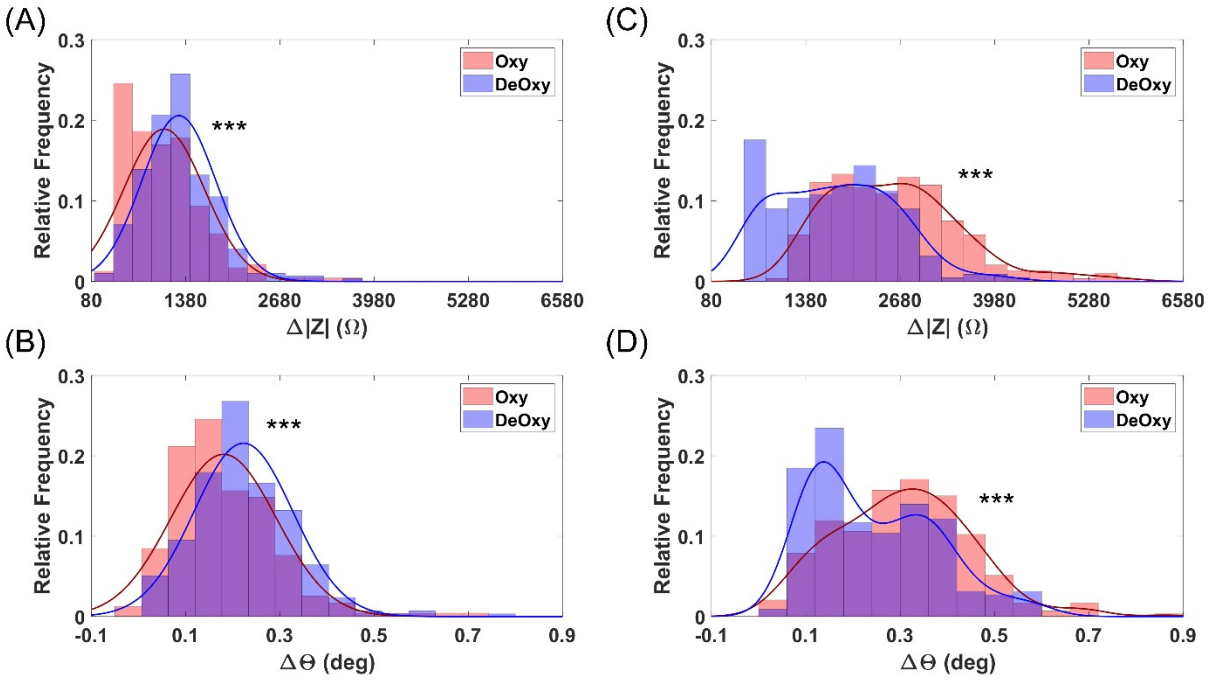

Figure 6. (A) Histogram depicting the relative magnitude of the impedance for detected normal cells in Oxy and DeOxy conditions. The data includes samples AA1 and AA2. (B) The corresponding relative phase of the impedance for detected normal cells from A. (C) The relative magnitude of the impedance for detected sickle cells in Oxy and DeOxy conditions. The data includes samples SS1, SS2, and SS3. (D) The corresponding relative phase of the impedance for detected sickle cells in C. *** represents $p < 0.001$.

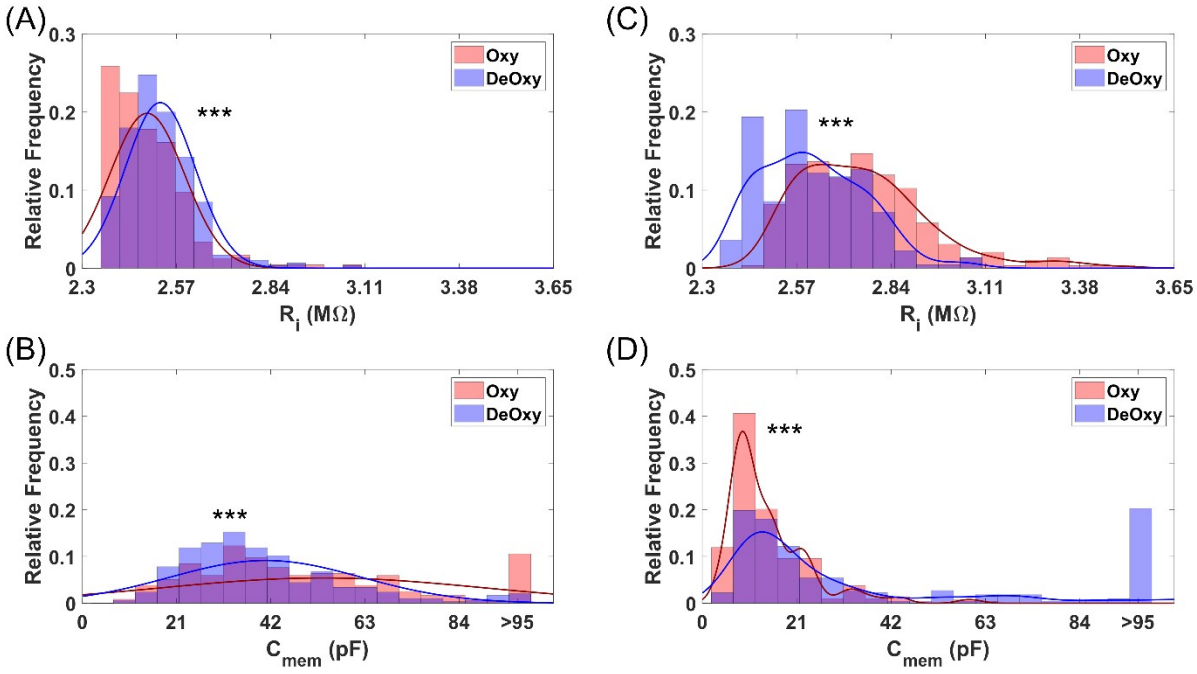

Figure 7. (A) This graph depicts the calculated internal resistance for detected normal cells in Oxy and DeOxy conditions. The data includes samples AA1 and AA2. (B) The calculated membrane capacitance for detected normal cells from A. (C) The calculated internal resistance for detected sickle cells in Oxy and DeOxy conditions. The data includes samples SS1, SS2, and SS3. (D) The calculated membrane capacitance for detected sickle cells from C. *** represents $p < 0.001$.