

Supplementary Data

Smartphone-Based pH Sensor for Home Monitoring of Pulmonary Exacerbations in Cystic Fibrosis

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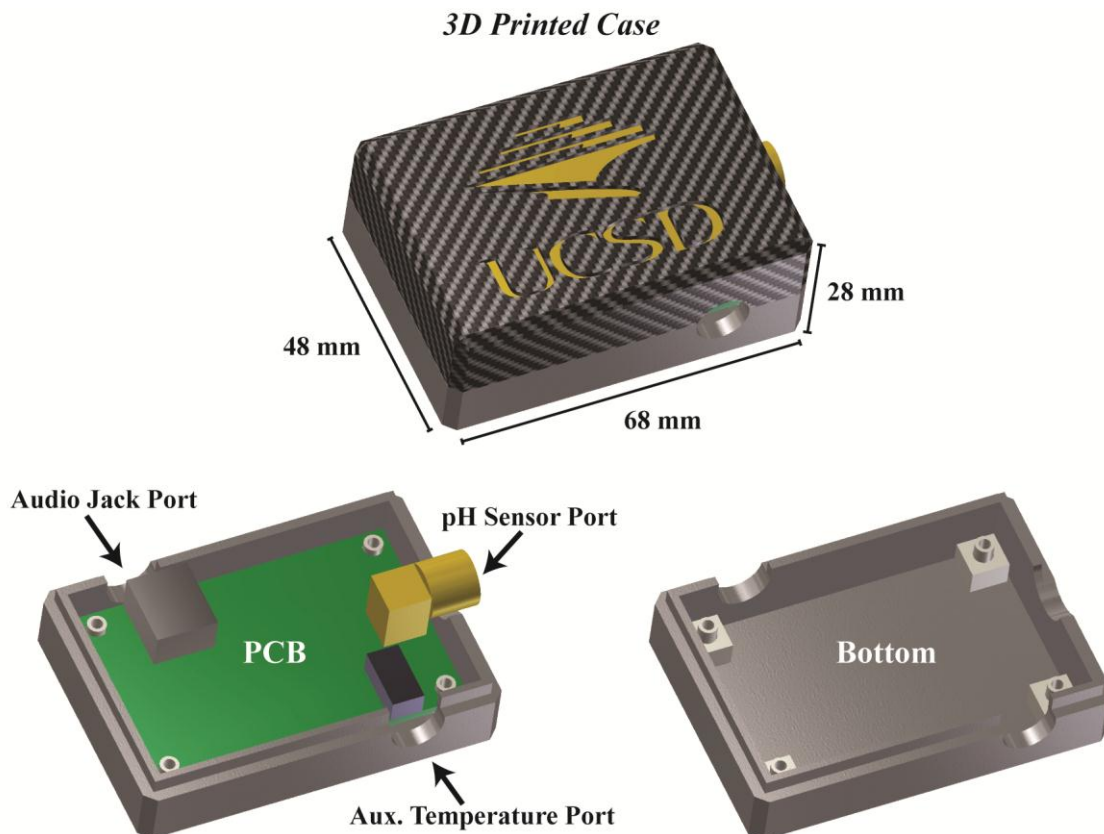


Figure S1. CAD images of 3D printed enclosure for the electronic device showing the complete device (top), uncovered with PCB (bottom left), and case bottom (bottom right).

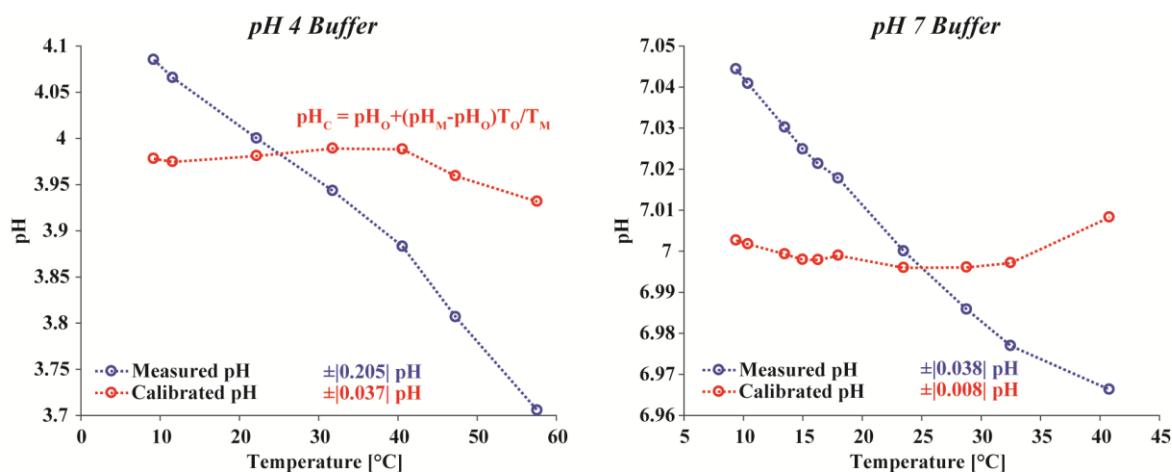


Figure S2. Sensor response to temperature variation and calibration of pH. This data was collected using the pH and temperature sensors submerged in both standard pH 4 and pH 7 buffers being heated and cooled externally. Without calibration, the maximum pH error reaches 0.205 and .038 pH for the pH 4 and 7 buffers, respectively. With calibration (pH_C), the variation is less than 0.037 and 0.008 pH, respectively. Since most sputum samples are approximately neutral and temperatures rarely deviate much from room temperature during testing, this error is minimal and temperature compensation is typically not required.

Table S1. Bill of materials

| Type | Company | Part # | Quantity | Price (@1000) | Total Price |
|-----------------------------------|----------------------|------------------|-----------------|--------------------------|------------------------|
| <i>Comparator</i> | NXP USA Inc. | NCX2200GW,125 | 2 | 0.15 | \$0.30 |
| <i>pH Sensor IC</i> | Texas Instruments | LMP91200MT/NOPB | 1 | 3.37 | \$3.37 |
| <i>OpAmp</i> | Texas Instruments | OPA2333AMDREP | 1 | 4.05 | \$4.05 |
| <i>Microcontroller</i> | Microchip Technology | PIC16F690-I/ML | 1 | 1.58 | \$1.58 |
| <i>Regulator IC</i> | Linear Technology | LTC3632EMS8E#PBF | 1 | 2.98 | \$2.98 |
| <i>Coupled Inductors</i> | Coilcraft | LPR6235-123QMRC | 1 | 1.21 | \$1.21 |
| <i>Schottky Diode</i> | Diodes Incorporated | DFLS120L-7 | 2 | 0.175 | \$0.35 |
| <i>Switch</i> | NXP USA Inc. | NX3L4053PW,118 | 1 | 0.383 | \$0.38 |
| <i>NMOS</i> | Diodes Incorporated | ZXM61N03FTA | 3 | 0.205 | \$0.62 |
| <i>PMOS</i> | Diodes Incorporated | ZXM61P03FTA | 3 | 0.205 | \$0.62 |
| <i>PCB Fabrication</i> | - | - | 1 | 1.566 | \$1.57 |
| Unit Cost (@qty 1,000) | | | | | \$17.02 |