

Supporting Information

Video 1

CSPH ion channel-based sensors compared to commercial infrared CO₂ meters

Abstract of Video 1

In the “IDEs: Experimental Test” process (Video 1), the entire sensing progress toward 50 ppm CO₂ are presented. The resistance changes of sensors directly correlated to the surface reaction were monitored with a Keithley 2450 digital source meter under excitation voltage of 20 V DC. During the measurement, an increase of resistance can be observed after 50 ppm CO₂ were injected into the 1 L sealed test chamber at room temperature. The recovery process can be observed after the CO₂ gas desorbed from the surface of the sensing layer.

The commercial IR CO₂ meter is put into a 5L sealed test chamber and calibrated in the test environment to obtain an initial value. Then inject different concentrations of CO₂, and the difference between the reading of the concentration value after the response is stable and the initial value is the response value. Video 1 shows the comparison between our sensors and commercial CO₂ meters. The result is that toward 50 ppm CO₂, our sensor shows a response value close to that of the commercial IR CO₂ meter, and has a shorter response time.

Video 2

Real-time detection video of the sensor

Abstract of Video 2

In the "IDE: Experimental Test" process (video 2), the whole sensing process towards 50-200 ppm CO₂ is shown. Under the excitation voltage of 20 V DC, the Keithley 2450 digital source meter is used

to monitor the resistance change of the sensor directly related to the surface reaction. During the measurement, the increase of resistance can be observed after CO₂ is injected into the 1L test chamber at room temperature. Additional resistance changes can be observed when continuing to inject CO₂. Video 2 shows the real-time response process of the sensor to 50-200 ppm CO₂.

Video 3

Detection of CO₂ in human exhalation

Abstract of Video 3

In the “IDEs: Experimental Test” process (Video 3), the entire sensing progress toward CO₂ of human exhalation are presented. The resistance changes of sensors directly correlated to the surface reaction were monitored with a Keithley 2450 digital source meter under excitation voltage of 20 V DC. During the measurement, an increase of resistance can be observed after CO₂ of human exhalation were injected into the 1 L test chamber at room temperature. The recovery process can be observed after the CO₂ gas desorbed from the surface of the sensing layer. The complete response and recovery sensing process toward CO₂ of human exhalation is presented in Video 3, respectively.