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Flow dependence of handheld breath analyzer for body fuel utilization monitoring

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Home healthcare medical technologies have been gaining popularity and are more affordable in recent years. Exhaled breath analysis has potential in this field and the development of gas sensor technology has enabled us to build a small affable breath analysis device together with the electronic nose concept. In this work, a handheld breath analyzer was developed for monitoring body fuel utilization. A hybrid gas sensor array, including electrochemical, optoacoustic, and chemo-resistive gas sensors was used to provide accurate measurement of oxygen and carbon dioxide in exhaled breath. The bypass configuration volume flow measurement method was developed to fit in a small portable device. The result shows that both oxygen and carbon dioxide sensors are flow-dependent due to individual slow response time of each sensor type. The response of optoacoustic sensor is relatively slower than those of other sensor types. Thus, a mathematical model was developed to correct the individual sensor value to get more accurate value of body fuel utilization. The comparing protocol for known concentration of the oxygen and carbon gases with various flow rate was conducted and the model of transfer functions to reconstruct original gas concentration was proposed.

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