Bio-fluorometric gas sensing and imaging of human volatiles
- Bio-sniffer & Sniff-cam -

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In our laboratory, gas-phase biosensors (Bio-sniffers, Sniff-cam) have been developed not only for human volatiles (acetone, methyl mercaptan, trimethylamine, ethanol, isopropanol, etc.) but also for residential harmful VOCs (formaldehyde, toluene, nicotine) causing sick-house syndrome, etc. In particular, the biofluorometric (BF) sniffers with an UV-LED excitation light and a PMT detector shows good sensitivity and gas-selectivity for continuous monitoring of target VOCs (formaldehyde, ethanol, acetaldehyde, acetone, isopropanol, etc.). In addition, the sniff-cam with enzyme immobilized mesh also demonstrates a spatio-temporal gas-imaging of human volatiles (i.e. ethanol, acetaldehyde, etc. after drinking). In this contribution, the bio-sniffer for breath acetone and the sniff-cam for skin ethanol in the gas phase will be introduced as novel non-invasive biosensing approaches.

The acetone sniffer was developed using a S-ADH (secondary alcohol dehydrogenase) reverse reaction by detecting on the NADH fluorometric system. The S-ADH sniffer was possible to continuous measure gaseous acetone from 7 ppb to 20ppm with a good gas-selectivity based on the enzyme specificity. The device allows to evaluate the acetone concentration in exhaled air from healthy subjects and diabetes patients (type I & II). And, the novel biofluorometric sniff-cam for ethanol was fabricated with ADH (alcohol dehydrogenase) immobilized mesh and the NADH visualization unit (UV-LED sheet array & highly sensitive CCD), thus imaging gaseous ethanol not only in exhaled air but also in skin gas after drinking.
The sniffer-devices would be useful for non-invasive detection of the volatile biomarkers in the fields of medical and health care.

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References

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