

Advanced Science and Technology for Biomedical Sensors (Biomedical Devices and Instrumentation)

1. Staffs and Students (April 2010)

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2. Education

We provide opportunity to study advanced biomedical devices and instrumentation. Students in our laboratory are working on the research projects as follows.

3. Research Subjects

1) Wearable chemical sensors for biomedical measurements

Flexible and biocompatible biosensors have been fabricated by using Soft-MEMS technology on functional polymer membrane, thus applying to non-invasive approaches of physical monitoring (i.e. transcutaneous gas monitoring and tear glucose measurement).

2) Biological odor measurement and smell communication

High selective gas-sensors -"Bio-sniffers"- have been constructed with biological recognition materials such as drug-metabolizing enzyme in human liver. Potential applications of the bio-sniffer and nose includes halitosis analysis, breath alcohol & aldehyde measurement, VOC sensing as environmental assessment, odorless chemical digital-code (watermark) system, smell informatics, etc.

3) Ubiquitous monitoring of biological information by using IT devices

Mobile human-monitoring system for vital signs has been constructed using cellular communication service and body-wired techniques.

4) Novel biological devices based on new driving principle with chemical energy

Bio-devices with high performance in electrical and mechanical properties have been investigated using functional biopolymer such as DNA, protein, lipid and sugar chain.

4. Publications

Original Article

1. Kudo H, Suzuki Y, Gessei T, Takahashi D, Arakawa T, Mitsubayashi K. Biochemical gas sensor (bio-sniffer) for ultrahigh-sensitive gaseous formaldehyde monitoring, *Biosensors and Bioelectronics* 26(2): 845-858, 2010.
2. Kato R, Munkhjargal M, Takahashi D, Arakawa T, Kudo H, Mitsubayashi K. An autonomous drug release system based on chemo-mechanical energy conversion "Organic Engine" for feedback control of blood glucose, *Biosensors and Bioelectronics* 26(4): 1455-1459, 2010.
3. Iguchi S, Chu MX, Takahashi D, Arakawa T, Kudo H, Mitsubayashi K. Soft-MEMS glucose sensor with functional polymers, *Journal of Photopolymer Science and Technology* 23(2):167-170, 2010.
4. Wang X, Ando E, Takahashi D, Arakawa T, Kudo H, Saito H, Mitsubayashi K. 2D spatiotemporal visualization system of expired gaseous ethanol after oral administration for real-time illustrated analysis of alcohol metabolism, *Talanta* 82(3): 892-898, 2010.
5. Arakawa T, Wang X, Ando E, Endo H, Takahashi D, Kudo H, Saito H, Mitsubayashi K. Real-time chemiluminescence visualization system of spacially-distributed exhausted ethanol breath on enzyme immobilized mesh substrate, *Luminescence* 25: 185-187, 2010.

6. Kudo H, Sawai M, Suzuki Y, Wang X, Gessei T, Takahashi D, Arakawa T, Mitsubayashi K. Fiber optic bio-sniffer (biochemical gas sensor) for high selective monitoring of ethanol vapor using 335 nm UV-LED, *Sensors and Actuators B*147(2): 676-680, 2010.
7. Koshida T, Arakawa T, Gessei T, Takahashi D, Kudo H, Saito H, Yano K, Mitsubayashi K. Fluorescence biosensing system with a UV-LED excitation for l-leucine detection, *Sensors and Actuators B* 146(1): 177-182, 2010.