

# Medical Technology (Biomedical Devices and Instrumentation)

## 1. Staffs and Students (April 2009)

Professor	Kohji MITSUBAYASHI	
Junior Associate Professor	Hiroyuki KUDO	
Assistant Professor	Takahiro ARAKAWA	
Assistant Professor	Daishi TAKAHASHI	
Lecturer (part-time)	Hitoshi MUGURUMA	
Engineer Official	Kumiko MIYAJIMA	
Research Staff	Mika HAYASHI	
Graduate Student	Xin WANG,	Mingxing CHU,
	Tomoko GESSEI,	Elito KAZAWA,
	Munkhjargal MUNKHBAYAR,	Yuki SUZUKI,
	Kazutaka KITA,	Yuki MATSUURA

## 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) Miyoshi Y, Miyajima K, Saito H, Kudo H, Takeuchi T, Karube I, Mitsubayashi K. Flexible humidity sensor in a sandwich configuration with a hydrophilic porous membrane. *Sens Actuators B Chem* 142(1): 28-32, 2009.
- 2) Kudo H, Sawai M, Wang X, Gessei T, Koshida T, Miyajima K, Saito H, Mitsubayashi K. A NADH-dependent fiber-optic biosensor for ethanol determination with a UV-LED excitation system. *Sens Actuators B Chem* 141(1): 20-25, 2009.
- 3) Chu MX, Kudo H, Shirai T, Miyajima K, Saito H, Morimoto N, Yano K, Iwasaki Y, Akiyoshi K, Mitsubayashi K. A soft and flexible biosensor using a phospholipid polymer for continuous glucose monitoring. *Biomed Microdevices* 11(4): 837-842, 2009.
- 4) Mitsubayashi K, Ohgoshi T, Okamoto T, Wakabayashi Y, Kozuka M, Miyajima K, Saito H, Kudo H. Tonometric biosensor with a differential pressure sensor for chemo-mechanical measurement of glucose. *Biosens Bioelectron* 24(5):1518-1521, 2009.
- 5) Gessei T, Sato H, Kazawa E, Kudo H, Saito H, Mitsubayashi K. Bio-sniffers for ethanol and acetaldehyde using carbon and Ag/AgCl coated electrodes. *Microchim Acta* 165(1-2):179-186, 2009.