OMB No. 0925-0001 and 0925-0002 (Rev. 03/2020 Approved Through 02/28/2023)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
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NAME: Kenta, iitani

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Postdoctoral Research Associate

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

| INSTITUTION AND LOCATION | DEGREE(if applicable) | Completion DateMM/YYYY | FIELD OF STUDY |
| --- | --- | --- | --- |
| National Institute of Technology, Numazu College | B.E. | 03/2014 | Computer Science |
| Tokyo Medical and Dental University | M.E. | 03/2016 | Analytical Chemistry |
| Tokyo Medical and Dental University | Ph.D. | 03/2019 | Analytical Chemistry |
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1. **Personal Statement**

**I am a start-up researcher who just received my Ph.D. in March of 2019. I studied robotics as an undergraduate but switched my specialty to analytical chemistry after graduate school. This is because I realized that to reproduce the human senses, which was a significant challenge in robotics, we needed to develop high-performance sensors, especially biosensors. Switching majors is not an easy thing to do. However, I like and excel at integrating research in various fields. As a result, I have published seven papers (selected as follows) on the research topics that I started in graduate school, and I have presented 18 oral presentations at international conferences for 4.5 years. I have also been selected for funding by the Japan Society for the Promotion of Science (JSPS) for doctoral students and postdoctoral fellows, which a gateway to becoming a researcher in Japan. In my opinion, I am convinced that this research project will be interdisciplinary in nature. For example, understanding the dynamics of CO2 in the human body requires medical expertise, the diffusion of CO2 outside the body through the skin requires knowledge of physics, and the development of a measurement system for transdermal CO2 requires expertise in chemical, electrical and mechanical engineering. I have expertise and experience in the measurement of transcutaneous VOCs. In particular, I am very proficient in the handling of human transdermal gas and exhaled breath, which is essential for this research project; therefore I can make an immediate contribution. For these reasons, my contribution is essential to the great success of this research project.**

1. Iitani, K., Chien P-J., Suzuki, T., Arakawa T., Toma, K., Iwasaki, Y., & Mitsubayashi K., (2017). Improved Sensitivity of Acetaldehyde Biosensor by Detecting ADH Reverse Reaction-Mediated NADH Fluoro-Quenching for Wine Evaluation. ACS Sensors, 2(7), 940-946.
2. Iitani, K., Chien P-J., Suzuki, T., Arakawa T., Toma, K., Iwasaki, Y., & Mitsubayashi K., (2018). Fiber-Optic Bio-sniffer (Biochemical Gas Sensor) Using Reverse Reaction of Alcohol Dehydrogenase for Exhaled Acetaldehyde. ACS Sensors, 3(2), 425-431.
3. **Iitani, K., Sato, T., Naisierding M., Hayakawa, H., Toma, K., Arakawa T., & Mitsubayashi K., (2018).** Fluorometric Sniff-Cam (Gas-Imaging System) Utilizing Alcohol Dehydrogenase for Imaging Concentration Distribution of Acetaldehyde in Breath and Transdermal Vapor after Drinking. Analytical Chemistry, 90(4), 2678-2685.

**B. Positions and Honors**

**Positions and Employment**

**2016-2019 JSPS Research Fellow DC1, Tokyo Medical and Dental University, Tokyo, Japan**

**2019- JSPS Research Fellow PD, Waseda University, Tokyo, Japan**

**2020- Cooperative research scholar, Institute of Biomaterials and Bioengineering, Tokyo, Japan**

**2020- Postdoctoral research associate, Center for Advanced Sensor Technology,**

**University of Maryland, Baltimore County, Baltimore, MD, USA**

**Other Experience and Professional Memberships**

**2016- Member, Japan Society of Applied Physics**

**2016- Member, Institute of Electrical Engineers of Japan**

**2016- Member, Electrochemical Society of Japan**

**2019- Member, Institute of Electrical and Electronics Engineers**

**2020- Member, American Chemical Society**

**Honors**

**2012 Student Research Award, *National Institute of Technology, Numazu College*, Shizuoka, Japan**

**2012 Poster Award, *Academic & Science Fair*, Shizuoka, Japan**

**2013 Poster Award, *Academic & Science Fair*, Shizuoka, Japan**

**2014 Grand Prize, *Japan Social Implementation Competition*, Tokyo, Japan**

**2014 Award for Best Student, *National Institute of Technology, Numazu College*, Shizuoka, Japan**

**2014 Student Research Award, *National Institute of Technology, Numazu College*, Shizuoka, Japan**

**2014 Poster Award, *26th SAS Intellignet Symposium*, Kanagawa, Japan**

**2015 Poster Presentation Runner up Award,**

***4th International Conference on Bio-sensing Technology*, Lisbon, Portugal**

**2016 Repayment Exemption for Students with Excellent Grades,**

**J*apan Student Services Organization*, Tokyo, Japan**

**2019 Research Encouragement Prize Award,**

***Institute of Biomaterials and Bioengineering*, Tokyo, Japan**

**2019 Poster Award, *2019 SAS Intelligent Symposium*, Kanagawa, Japan**

**C. Contributions to Science**

**1. Fundamental Study of imaging methods for transdermal volatile organic compounds (VOCs).**

**After changing the my research field from robotics to analytical chemistry, I worked on the imaging of VOCs using enzyme-based chemiluminescence methods. My major contributions have been in conducting experiments with human subjects and developing methods for analyzing chemiluminescence imaging data that take advantage of the image processing performed in my bachelor's research.** **Experimental results showed that the distribution of VOCs in the blood reflecting human metabolism released transdermally could be achieved with the developed gas imaging method (publication a). On the other hand, the measurement system was not sensitive enough to measure the temporal variation of transdermal ethanol release. These results determined the direction of subsequent research. Besides, this methods was applied to imaging of ethanol vaporization from wine poured in different shape of wine glass as a spin-off study (publication b).**

1. **Iitani, K., Sato, T., Wang, W., Toma, K., Arakawa, T., & Mitsubayashi, K., (2014).** “Sniffer-camera” using enzyme reaction for visualization of transpired ethanol from palm skin. Journal of Advanced Science, 26(3+4), 20-22.
2. Arakawa, T., Iitani K., Wang, X., Kajiro T., Toma, K., Yano K., & Mitsubayashi, K., (2015). A sniffer-camera for imaging of ethanol vaporization from wine: the effect of wine glass shape. Analyst, 140(8), 2881-2886.

**2. Improvement of gas-imaging system utilizing fluorometric bio-sensing method.**

**Maintaining the basic concept of using the enzyme's substrate specificity to enhance gas selectivity, fluorescence bio-sensing method with the NADH-dependent alcohol dehydrogenase was used to improve the sensitivity of the gas imaging system. Firstly, we constructed a fluorescence imaging system for ethanol gas. This system was 10 times more sensitive than the conventional chemiluminescence system. As a results of experiment with human sample, I displayed the emission distribution of ethanol transpired from the skin firstly in the world (publication a). Subsequently, I published a series of biosensors and imaging systems for acetaldehyde gas, focusing on the reversibility of the catalytic capacity exhibited by alcohol dehydrogenase (publication b and c).** **These studies showed that enzyme-based methods can be applied to imaging a wide variety of VOCs and have potential applications in non-invasive metabolic monitoring and facile disease screening.**

1. **Arakawa, T., Sato, T., Iitani, K., Toma, K., & Mitsubayashi, K., (2017).** Fluorometric Biosniffer Camera “Sniff-Cam” for Direct Imaging of Gaseous Ethanol in Breath and Transdermal Vapor. Analytical Chemistry, 89(8), 4495-4501.
2. Iitani, K., Chien P-J., Suzuki, T., Arakawa T., Toma, K., Iwasaki, Y., & Mitsubayashi K., (2018). Fiber-Optic Bio-sniffer (Biochemical Gas Sensor) Using Reverse Reaction of Alcohol Dehydrogenase for Exhaled Acetaldehyde. ACS Sensors, 3(2), 425-431.
3. **Iitani, K., Sato, T., Naisierding M., Hayakawa, H., Toma, K., Arakawa T., & Mitsubayashi K., (2018).** Fluorometric Sniff-Cam (Gas-Imaging System) Utilizing Alcohol Dehydrogenase for Imaging Concentration Distribution of Acetaldehyde in Breath and Transdermal Vapor after Drinking. Analytical Chemistry, 90(4), 2678-2685.

**3. Focusing on real-time monitoring and imaging of transdermal VOCs**

**In recent years, we have focused on elucidating the release kinetics of transdermal VOCs while continuing the development of gas imaging systems. A study that measured the distribution of ethanol released from multiple sites around the hand in a quasi-simultaneous manner and compared it to sweat rates found that the suitable site for transdermal measurement of VOCs was at the wrist (publication a). We also developed a biosensor for VOCs that operates on the wrist, which we believe will contribute to non-invasive metabolic monitoring (publication b and c). Moreover, I developed optimal optical system for the gas-imaging system. It enabled to measure spatiotemporal change of transdermal VOCs in real-time. The system was used to measure transcutaneous VOCs at various sites throughout the body. As a result, for the first time in the world, the ear was shown to be the most suitable site for measuring transcutaneous VOCs (publication d and e). These studies were highlighted in the American Chemical Society (cover & press release) and received high praise.**

1. **Iitani, K., Naisierding, M., Toma, K., Arakawa, T., & Mitsubayashi, K., (2020).** Evaluation for regional difference of skin-gas ethanol and sweat rate using alcohol dehydrogenase-mediated fluorometric gas-imaging system (sniff-cam). Analyst, 145(8), 2915-2924.
2. Arakawa T., Suzuki, T., Tsujii M., Iitani, K., Chien, P-J., Ye, M., Toma, K., Iwasaki, Y., & Mitsubayashi K., (2019). Real-time monitoring of skin ethanol gas by a high-sensitivity gas phase biosensor (bio-sniffer) for the non-invasive evaluation of volatile blood compounds. Biosensors and Bioelectronics, 129(July 2018), 245-253.
3. **Arakawa T. Aota, T., Iitani, K., Toma, K., Iwasaki, Y., & Mitsubayashi K., (2020). Skin ethanol gas measurement system with a biochemical gas sensor and gas concentrator toward monitoring of blood volatile compounds.** Talanta, In-Press.
4. Iitani, K., Toma, K., Arakawa, T., & Mitsubayashi, K., (2019). Ultrasensitive Sniff-Cam for Biofluorometric-Imaging of Breath Ethanol Caused by Metabolism of Intestinal Flora. Analytical Chemistry, 91(15), 9458-9465.
5. Iitani K., Toma, K., Arakawa, T., & Mitsubayashi, K., (2020). Transcutaneous Blood VOC Imaging System (Skin-Gas Cam) with Real-Time Bio-Fluorometric Device on Rounded Skin Surface. ACS Sensors, 5(2), 338-345.

**Complete List of Published Work in MyBibliography (9 paper as first author / totally 13 paper):**

<https://www.ncbi.nlm.nih.gov/myncbi/1BAKVjzadt4s5P/bibliography/public/?sortby=pubDate&sdirection=ascending>

**D. Additional Information: Research Support and/or Scholastic Performance**

**Ongoing Research Support**

**JSPS KAKENHI (Grant-in-Aid for Scientific Research)**

**JP19J01649 04/01/19-03/31/22**

**Three-dimensional imaging of gaseous chemicals using electrospinning**

**The goal of this study is develop a non-invasive health monitoring method based on bio-sensing method for 3D imaging of volatile organic compounds emanated from human skin.**

**Role: PI**

**JSPS KAKENHI (Grant-in-Aid for Scientific Research)**

**19KK0259B1 10/07/19-03/31/24**

**The goal of this study is to develop a mouth guard wearable biosensor and evaluate its performance in the field in collaboration with Dr. Dao in Griffith University, Australia.**

**Role: Co-Investigator**

**Completed Research Support**

**JSPS KAKENHI (Grant-in-Aid for Scientific Research)**

**JP16K09604 04/01/16-03/31/19**

**The goal of this study is to develop a method for measuring the spatiotemporal distribution of trans-2-nonanal, the causative agent of body odor that occurs with aging of humans.**

**Role: PI**

**Mitsubishi Material’s Research Grant 06/01/19-05/31/20**

**The goal of this project is to develop a method for immobilizing biomolecule such as enzyme in nano/micro scale fibers using electrospinning technique.**

**Role: PI**