“MSS” and “AMA” towards Mobile Olfaction

Keywords : Odor, Olfaction, Receptor, Big data analy

Back-ground

The demands for new sensors to detect or identify target molecules are rapidly growing in various fields; food, medicine, environment, security, *etc*. We are trying to optimize the key components (sensing elements / receptor layers / data analysis) through basic science. To establish a *de facto* standard for odor analysis and sensor systems by integrating cutting edge technologies, we launched the industry-academia-governmental alliance.

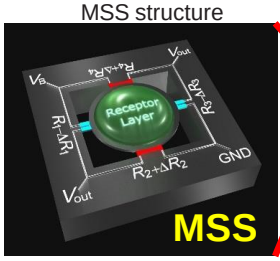
We are also developing a new analysis method based on a new concept.

Aim

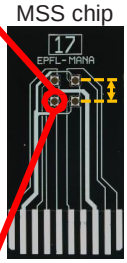
- Development of a new sensor “MSS” which fulfills the requirements for mobile olfaction
- Demonstration of various smell identification using USB-powered/operated prototype system
- Development of new functional receptor materials and signal analysis models
- Development of new mass analysis method “AMA” based on new working principle

Advanced Research Topics

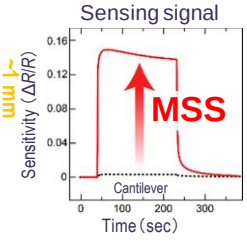
MSS structure



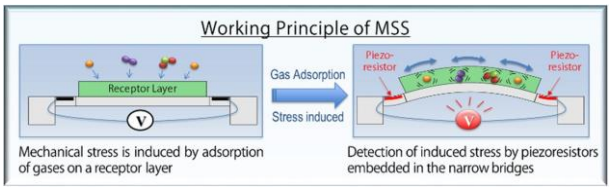
MSS chip



Sensing signal



Sensitivity more than 100 times



- **High Sensitivity** (ppm~ppb~)
- **Small Size** (100ch/cm²)
- **High Versatility** (various materials applicable as a receptor)
- **Quick response** (~sec)
- **Thermal, Electrical, Mechanical Stability**
- **Low power consumption** (<1 mW/ch)
- **Low cost**

Application Examples of MSS

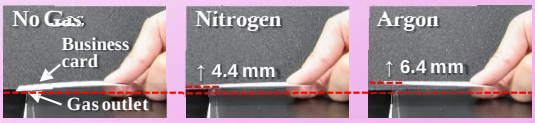
- **Cancer diagnosis through breath analysis**
  IEEE MEMS 26 (2013) p.621
- **Identification of spices**
  JJAP (2016)
- **Meats, Perfumes, Gasolines**, *etc.*

MSS Alliance: launched jointly with four companies and a university to establish a *de facto* standard for odor analysis and sensor systems (since September, 2015)

New Mass Analysis even with a *business card*

【Aero-Thermo-Dynamic Mass Analysis：AMA】

No Ionization ／ No Vacuum ／ Mobile



Publications

- G. Yoshikawa, T. Akiyama, S. Gautsch, P. Vettiger, H. Rohrer, *Nano Letters* 11, 1044 (2011).
- G. Yoshikawa et al., *Sensors* 12, 15873 (2012).
- K. Shiba and G. Yoshikawa, *Scientific Reports* 6, 28849 (2016).

Summary

- Creation of new IoT olfaction industries is expected through combination with cloud computing and big data analysis in various fields including food, medicine, environment, and security.
- Granted Patents: 5649138, 5743026, 5891465, *etc*. many patents pending.

Research outcome

- Control of external perturbations (temperature, humidity, *etc*.)
- Optimization of elemental technologies
- Reproducibility at system level
- Statistical demonstration with large number of samples
- Establishment of practical business model

Genki Yoshikawa, Nano-Life Field
E-mail : YOSHIKAWA.Genki●nims.go.jp
URL : http://y-genki.net