（For JSPS Fellow）

Form B-5

Date（日付）18/11/2014

（Date/Month/Year：日/月/年）

Activity Report -Science Dialogue Program-
（サイエンス・ダイアログ事業　実施報告書）

- Fellow's name（講師氏名）:　 Carl Frederik Benedikt WERNER 　　（ID No.　P14037　　）

- Participating school（学校名）:　　Aichi Prefectural KASUGAI High School

- Date （実施日時）:　18/11/2014　　　　　　　　　　　　　　（Date/Month/Year：日/月/年）

- Lecture title（講演題目）:　（in English）　Chemical imaging sensor

　　　　　　　　　　（in Japanese）

- Lecture summary（講演概要）: Please summary your lecture 200-500 words.

After a short introduction about Europe and Germany the lecture started to explain sensor and expecially chemical sensors.

Sensors are devices to detect events and changes in quantities and provides a corresponding output, generally as an electrical of optical signal. They can divided in groups of e.g., physical sensors, optical sensors and chemical sensors. In our daily life, sensor can be found almost everywhere and they are prepared to help (e.g. automatically open a door or switch on the light when someone enters a room). Also many miniaturized sensors can be found in modern smartphones.

Chemical sensors are self-contained analytical devices that can provide information about the chemical composition of their environments that could be, liquids or a gas phases. Typical analytes that can be observed with chemical sensors are for example gas compositions or ion and molecule concentration in aqueous solutions. A well-known ion concentration is the hydrogen-ion concentration, often expressed as pH value. With the help of a pH meter the pH value can be determined. A common working principle of a pH meter is based on a field effect (FET) transistor.

To get familiar with the concept of chemical sensors and the pH value the student are asked to guess the pH value of some drinks (tea, cola, milk, lemon, orange juice, apple juice and grape juice). After that, the students have performed real pH measurements with a FET-based pH meter to these drinks. The resulting pH values were then compared with the guessed one.

More complex chemical sensors are biosensors in which the recognition element utilizes a biochemical mechanism. An example of those biological recognition elements are enzymes. The glucose meter is a popular biosensor utilizing an enzyme (glucose oxidase) to detect selectively the glucose concentration in blood. It is a key element of home blood glucose monitoring by

people with diabetes mellitus. This example of a biosensor show that it is often (especially for biomedical application) necessary to detect complex analytes. To achieve this, chemical sensors are enhanced by biological recognition elements.

While the most chemical sensors, like the pH meter only can determine the average concentration of the media, a light-addressable potentiometric sensor (LAPS) can perform a specially resolved measurement of the concentration distribution. Therefore, the sensor plate is scanned by a light pointer in a raster like manner to determine the analyte concentration at different positions on the sensor surface. The resulting concentration values are depicted in a false color image, a so called chemical image. This concept was demonstrated, by showing a video of the change of the pH-value distribution after electrolysis in a weak buffered solution.

To develop this kind of (bio-)chemical imaging sensors many research fields are involved, mainly electrical engineering, software development, micro fabrication, physics (semiconductors), chemistry, biology and biomedical engineering.

- Language used（使用言語）:　 English

- Lecture format（講演形式）:
 ◆Lecture time（講演時間）　　 50 min（分）, Q&A time（質疑応答時間）　 0 min（分）
 ◆Lecture style（ex.: used projector, conducted experiments）
　 （講演方法（例：プロジェクター使用による講演、実験・実習の有無など））
　 80% presentation by video projector, 20 % conducted experiments (pH measurments)
 ◆Interpretation（ex.: assistance by accompanied person, provided Japanese explanation by yourself）（通訳（例：同行者によるサポート、講師本人による日本語説明））
　　 assistance by accompanied person
 ◆Name and title of accompanied person（同行者 職・氏名）
　　 Prof. Tatsuo YOSHINOBU (host professor)
 ◆Other note worthy information（その他特筆すべき事項）:
　 Since the conducted experiments took longer than expected,It was not enough time to explain the LAPS part in detail.

- Impressions and opinions from accompanied person（同行者の方から、本事業に対する意見・感想等がありましたら、お願いいたします。）:
　 It would be helpful if the lecture time could be extended to 90 minutes