

(For JSPS Fellow)

Form B-5

Date (日付)

01.07.2014 (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): Ludmila Cojocar (ID No. P12799)
- Participating school (学校名): Junior High and Senior High School at Komaba, University of Tsukuba
- Date (実施日時): 28.06.2014 (Date/Month/Year: 日/月/年)
- Lecture title (講演題目): (in English) Inspiration from the nature: Dye-sensitized solar cells (DSCs)  
(in Japanese) 自然からのインスピレーション: 色素増感太陽電池
- Lecture summary (講演概要): Please summary your lecture 200-500 words.

My lecture at Junior High and Senior High School at Komaba consisted in 5 sections, covered the following topics:

**I. Self introduction**

(who I am, where I am from, my scientific carrier (Moldova-France-Japan).

**II. Introduction to my country-Moldova**

(traditions, cuisine, famous people and places)

**III. Introduction to my experience in France**

(traditions, cuisine, famous people, places in general and more detailed about Bordeaux where I did my PhD)

**IV. Scientific work in Japan**

**Abstract:** The largest challenge for our global society is to find ways to replace the slowly but inevitably vanishing fossil fuel supplies by renewable resources and, at the same time, avoid negative effects from the current energy system on climate, environment, and health. Solar energy is the foremost power source of our planet and is expected to play a crucial role as a future energy source. The direct conversion of the solar light into electricity is one of their most attractive ways to harvest the solar energy. Although the capacity of solar power generation has been steadily increasing, it is necessary to reduce power generation cost even further to foster the implementation of solar cells. More than 90% of solar cells put in market are silicon-based solar cells. Nonetheless, silicon-based solar cells are hampered by relative high production costs, rendering the power generation uncompetitive with the conventional ones. These limitations have therefore given rise to new concepts – next generation solar cells. In this context, dye sensitized solar cells (DSCs), developed by Prof. Graetzel in 1991, have received sustained attention as one of the most promising photovoltaic technologies, both for their low-cost

materials, eco-friendly production processes, transparency, different variety of designs and colors. The concept of the DSCs is similar to the natural process of photosynthesis, where a dye adsorbed onto a mesoporous semiconductor ( $\text{TiO}_2$ ) emulates the roles of chlorophyll and when exposed to sunlight is photoexcited. After light absorption the excited dye molecule injects an electron into the  $\text{TiO}_2$  and is itself regenerated by redox electrolyte (I used the video to better understanding). The main feature of interest of the DSC lies in the cheap and simple manufacture.

#### V. Demonstration and experiment

For better understanding the cell performance and how dyes sensitized solar cells works, I showed for the students how to prepare a device using very cheap materials (with every days life examples:  $\text{TiO}_2$ -main constituent of the paint, dye-hibiscus tea, electrolyte-iodide based electrolyte used in medicine, counter electrode-based on carbon (graphite)). Incorporating theoretical research activities with practical experiment was a nice opportunity to provide better understanding of the concept, enriched students learning and motivation in the lecture.

#### Discussion and questions

Finally, in a last part of my lecture, we spent a very enjoyable time with students from Junior High and Senior High School at Komaba, it was the time for discussion and questions.

- Language used (使用言語): English

- Lecture format (講演形式):

◆ecture time (講演時間) 80 min (分), Q&A time (質疑応答時間) 30 min (分)

◆ecture 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))

Projector, experiments, demonstration material (DSCs)

◆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 for japanese translation by accompanied persons Prof. Kubo and PhD

student Fumiyasu Awai

◆Name and title of accompanied person (同行者 職・氏名)

Professor Takaya Kubo, PhD student Fumiyasu Awai

◆Other note worthy information (その他特筆すべき事項):

In order to help the students for better understanding, many demonstrations have been incorporated.

- 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。):

最先端研究を話題として、異なる言語や文化との接点を、次世代を担う高校生に与える本企画は、大変有意義と思います。聴講生は英語に対する興味が高く、講義内容全般に渡って活発なやり取りが印象的でした。ご担当の先生からお礼のメールメッセージを頂きました。これまでに行ってきた類似の講義の中で、最も多くの質問が出たとのこと。実演や講義内容を工夫し、しっかりと準備をして講義に臨んだ、コジヨカル氏の努力の結果と感じております。