

様式 A-1
(FY2025)

令和7年 9月 3日

サイエンス・ダイアログ 実施報告書

1. 学校名: 埼玉県立春日部高等学校
2. 講師氏名: Dr. Patrycja Roszkowska
3. 講義補助者氏名: 教諭 中川 未来
4. 実施日時: 令和7年 9月 2日 (火) 16:00 ~ 17:00
5. 参加生徒: 1年生 9人、 2年生 13人、 (合計 22人)
備考: (例: 理数科の生徒)
6. 講義題目: What is Non-thermal Plasma and Chemistry...and a little bit about being a scientist
7. 講義概要: 講師の自己紹介 研究内容 質疑応答 オンラインクイズ
8. 講義形式:
☒対面 ・ ☐オンライン (どちらか選択ください。)
1) 講義時間 45 分 質疑応答時間 15 分
2) 講義方法 (例: プロジェクター使用による講義、実験・実習の有無など)
プロジェクター使用による講義 オンラインクイズ 質疑応答
3) 事前学習
☒有 ・ ☐無 (どちらか選択ください。)
使用教材: 語彙リスト 関連動画リンク紹介
9. その他特筆すべき事項:

Form B-2
(FY2025)
Must be typed

Date (日付)
2/09/25 (Date/Month/Year: 日/月/年)

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

- Fellow's name (講師氏名): Patrycja Roszkowska (ID No. PE24757)

- Name and title of the lecture assistant (講義補助者の職・氏名)

英語科 教諭 中川 未来

- Participating school (学校名): Saitama Prefectural Kasukabe Senior High School

- Date (実施日時): 2/09/25 (Date/Month/Year: 日/月/年)

- Lecture title (講義題目):

What is Non-thermal Plasma and Chemistry...and a little bit about being a scientist

- Lecture format (講義形式):

◆ ☒ Onsite ・ ☐ Online (Please choose one.) (対面 ・ オンライン) ((どちらか選択ください。))

◆ Lecture time (講義時間) 45 min (分), Q&A time (質疑応答時間) 15 min (分)

◆ Lecture style (ex.: used projector, conducted experiments)

(講義方法 (例: プロジェクター使用による講義、実験・実習の有無など))

Lecture slides accompanied with online quiz, group discussion and videos to support more difficult concepts.

- Lecture summary (講義概要): Please summarize your lecture within 200-500 words.

This lecture introduces the fundamentals of **plasma**, explaining its characteristics, practical applications, and relevance in science and technology. The complexity of the subject was adjusted to a high school audience.

Plasma is defined as a state of matter composed of free electrons, ions, and neutral atoms. When electrons are accelerated within the plasma, they collide with atoms, generating more electrons and leading to a cascading ionization process. There are two types of plasma: thermal and nonthermal plasma. Thermal plasmas, like those found on the sun, have electrons and nuclei in thermal equilibrium with extremely high temperatures. In contrast, nonthermal plasmas, such as those in lightbulbs, feature extremely energetic electrons while the surrounding gas remains relatively cool. This distinction is not only fundamental to plasma physics but also determines how plasma can be safely handled and applied.

One of the primary motivations for studying non thermal plasma lies in its diverse applications,

particularly in agriculture and food safety. Plasma-activated liquids are used for decontamination and can generate useful substances such as ozone, hydrogen peroxide, and nitrates. These substances support reduced food waste and nonthermal methods for pasteurizing or sterilizing food. As a result, the use of plasma in agricultural practices leads to increased crop yields, improved germination, reduced bacterial contamination at harvest, and the breakdown of pesticides and mycotoxins. The flexibility and low energy requirements of atmospheric cold plasma technology position it as a promising tool that could replace or augment several stages in food production.

The catalytic role of plasma in chemistry is another central theme. Plasma can serve as a “super catalyst” that accelerates chemical reactions efficiently and cost-effectively compared to traditional catalysts made from metals or hazardous chemicals. Because plasma catalysts are formed from gases, (if used with precise experiment planning) they do not generate hazardous waste and are easy to produce and manage, facilitating more sustainable chemical processes. However, the progress of non-thermal plasma applications is limited by understanding of the topic, which is where my research focus is. Therefore, final parts of the ‘science concepts’ in the lecture stresses the importance of scientific diagnostics in plasma, which help to understand the complexity of plasma allowing for more controlled plasma use. In this lecture the Optical Emission Spectroscopy was used as an example of diagnostic tool. This method measure the wavelengths of light emitted by atoms and molecules in plasma as they transition between energy states, enabling researchers to identify molecular compositions and better understand the underlying processes. Interpreting such data is critical for advancing plasma science.

Finally, the lecture addresses the human dimension of scientific work, underscoring the value of diversity in research environments and encouraging traits such as curiosity, patience, and open-mindedness. Aspiring scientists are urged to seize learning opportunities, embrace making mistakes as part of the growth process, and enjoy the pursuit of discovery. Diversity and inclusive practices are presented as essential to fostering creativity and innovation within scientific communities.

In summary, this lecture positions plasma as a vital scientific phenomenon with broad technological applications, especially for sustainable agriculture, food safety, and cleaner chemical processes, while emphasizing the personal and societal value of diversity and lifelong learning in scientific research.

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

- Impressions and comments from the lecture assistant (講義補助者の方から、本プログラムに対する意見・感想等がありましたら、お願いいたします。):

Patrcja has been very helpful in communicating and working with me to prepare for her lecture, so there were no problems with organizing. My students, although at different levels of English proficiency, seemed to enjoy and understand the content, as we had many more questions than I expected. Some students even asked their questions in English, which shows that they

understood the lecture and were interested in the content.

We learned that plasma has great potential, and we hope that plasma technology will contribute to society and make a big difference in the near future.

The students enjoyed the online quiz very much, and since we also had some time for discussion and questions, we were able to relax and stay focused.

Thank you very much!

Plasma in chemistry processes

Plasma can act as a catalyst in chemical reactions.

Catalyst something that helps reaction happen faster and more efficiently without getting used up in the process.

