

MEXT NUCLEAR RESEARCHER EXCHANGE PROGRAMME IN QUANTUM SCIENCE TECHNOLOGY (QST), TAKASAKI JAPAN

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MEXT fellowship program takes place from 24th September 2024 until 21st December 2024, in Quantum Science Technology (QST), Takasaki Japan. The fellowship focused on the synthesis and modification of bioadhesive hydrogels for potential medical applications such as wound healing. It provided a unique opportunity to collaborate with experts, enhance laboratory skills, and gain exposure to cutting-edge research techniques in gamma irradiation and material science. The primary objective of the research was to develop a bioadhesive hydrogel system using **Polyvinyl Alcohol (PVA)** and **L-DOPA**, inspired by mussel adhesive proteins, to improve wound healing properties. Key activities during the fellowship included:

- **Hydrogel Fabrication**

A PVA solution was prepared and gamma-irradiated at QST's advanced facilities, creating a crosslinked hydrogel with enhanced mechanical strength. This method eliminates the need for toxic chemicals, making it safer for medical applications.

- **Surface Modification**

L-DOPA, a mussel-inspired adhesive material, was incorporated into the hydrogel through gamma radiation. This modification enhanced the adhesive strength of the hydrogel, particularly in wet environments, making it suitable for biomedical applications.

- **Characterization**

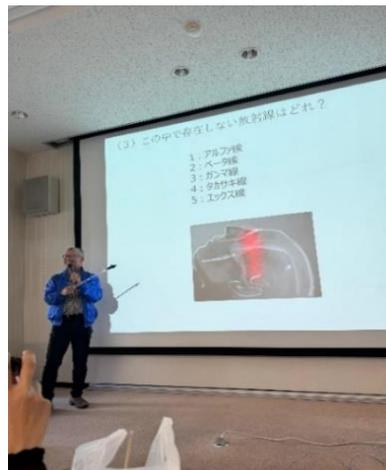
- The modified hydrogels were characterized to evaluate their adhesive strength, swelling capacity, and surface morphology.
- Analytical techniques such as Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) was also conducted to assess incorporation of LDOPA on the backbone polymer.



As part of the fellowship, participants engaged in several workshops, collaborative events, and facility tours:

- **QST Open Day (20 September 2024)**

The event showcased QST technological advancements and research activities. The QST facilities is open for the public and the scientist exhibiting their products and the technologies to the visitors. Apart from that, visitors explored interactive exhibits, demonstrations, and presentations, offering insights into cutting-edge technologies and fostering networking opportunities.



- **FNCA 2024 Workshop on Radiation Processing and Polymer Modification (RPPM) for Agricultural, Environmental and Medical Applications (4 - 8 November 2024)**

The FNCA meeting served as a platform for knowledge exchange between international experts (10 countries) in nuclear science and material research. The meeting focused more on the radiation processing and polymer modification to be applied in agricultural, environmental and medical application. The discussions included regulatory guidelines and the potential applications of advanced materials in various industries.



- **SciFiesta in Takasaki City (10 - 11 December 2024)**

SciFiesta, held at the Takasaki City Center, brought together researchers from QST for an exciting conference focused on scientific advancements and innovations. The event featured both poster and oral presentations, providing an excellent opportunity for researchers to share their latest findings and engage in discussions. The conference showcased a variety of projects rooted in QST, offering participants a broader view of the institution's ongoing research. Additionally, SciFiesta served as a hub for networking, allowing attendees to forge new connections, exchange ideas, and explore

potential collaborations. This event was instrumental in stimulating creative thinking and generating new ideas within the research community.



• **Facility Tours and greetings by the Director of QST**

As a fellow in MEXT programme, the participants had chance to visit QST's irradiation facilities, advanced biodevice labs, and the Takasaki Ion Accelerators for Advanced Radiation Application (TIARA) facilities. These tours provided a closer look at the operational aspects of gamma irradiation and ion beam technologies used in material modification. QST scientists and officers offered detailed explanations about the capabilities of the facilities, including how ion beam applications are used for precise material alterations. These hands-on insights bridged the gap between theoretical concepts and their real-world application.



During the last day of the program, participants had the honor of meeting the General Director of QST Takasaki, Dr. Maekawa Yasunari who welcomed attendees. In addition, the fellowship was highlighted by a visit from Dr. Muhammad Rawi Mohamed Zin, the Deputy Director General of the Malaysian Nuclear Agency. His visit emphasized the importance of strengthening the ties between Malaysia and Japan in scientific research and nuclear technology.