

# MERIT Internship Report

School of Engineering, Department of Materials Engineering

3<sup>rd</sup> year of Ph.D. / MERIT-WINGS 10th

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## **Abstract of internship ;**

**Host company ;** Mitsubishi Research Institute (MRI)

**Term ;** 2023/7/26 — 9/8

**Themes ;** Survey of civilian technology trends related to the security sector of Japan

## **Background ;**

The field of materials science has attracted a great deal of attention in both academia and industry, and research and technological development is progressing remarkably on a global scale. On the other hand, because of its inherently strong relationship with underground resources, it is also a field in which the importance of a theme may differ greatly from country to country or region to region, even if the research is on the same material. For example, in my research on permanent magnets, there is the problem that the reserves of rare earth elements (rare earths), which exhibit unique magnetism derived from 4f electrons, are unevenly distributed in certain countries and regions other than Japan. For this reason, research on rare earth saving permanent magnets has been considered important in Japan, and large budgets have been invested in this area, but such research is rarely carried out in countries blessed with rare earth resources. In addition, advanced materials are widely used not only in civilian applications but also in technologies related to security, and the security field cannot be ignored as an assumed demand for materials development. Therefore, it is extremely important to analyze, investigate and understand the security environment surrounding Japan and how research in the field of materials science can be involved in solving these issues, in order to promote materials science research in Japan in the future. We organized this internship in the hope that by conducting research at MRI, which conducts surveys and research on these themes together with the relevant ministries and agencies, I will be able to take a more multifaceted and bird's-eye view of my own research theme.

## **Themes ;**

The following two main tasks were carried out during the research internship. Details are omitted from this report as they include non-public information.

(1) Examination of the relationship between research and development in the field of

materials science and the security environment.

The relevance was examined based on the Defense Technology Guidelines 2023 published in June this year.

(2) Investigation of trends in civilian technology related to the security field, not limited to the materials science field.

A survey of civilian technology was carried out based on publicly available information on several specific fields.

In addition, strategy documents and reports published by government agencies and think-tanks in various countries related to the above two tasks were read, their contents and methods used were analyzed, and reports were compiled into reports and presentation materials.

### **Comment ;**

As a student majoring materials engineering and conducting research on permanent magnet materials involving rare earth elements, I have long been interested in the resource issues and diplomatic and security issues that lie behind such research, as well as the differences in research trends between countries and regions. Being able to undertake an internship at a think tank that broadly perceives and discusses such issues in relation to my field of study was extremely beneficial in understanding my own research theme from multiple perspectives. In addition, I was able to understand the way of thinking of think tanks, which is different from that of universities, while conducting actual surveys and research. For example, in graduate school research, it is fundamental to plan for the future based on current technology, but in this internship, it was necessary to think about what kind of technology should be invested in and developed by thinking backwards from the expected future situation and social issues. This way of thinking was only possible because of the internship at MRI, where there is a lot of interaction with government agencies, and we consider it a major benefit. Frequent discussions with several employees taught me not only how to think, but also how to research and summarize, which was a great learning experience.

### **Acknowledgments ;**

I would like to express my sincere gratitude to everyone at MRI who helped me during this internship. In particular, I would like to thank the people in the host department for providing us with frequent opportunities for discussion, despite their busy schedules. I would like to express my deepest gratitude for accepting this internship, even though it was probably unprecedented. I would also like to thank my supervisor, Prof. Naoya Shibata, my vice supervisor, Prof. Satoshi Watanabe, and all professors and administrators involved in this MERIT program for providing me with this precious internship opportunity.