

先端国際共同研究推進事業
2024 年度採択

次世代のための ASPIRE
量子分野

2024 年度 年次報告書（公開版）

研究課題名	電荷秩序を用いたトポロジカル物質の磁気機能開拓
日本側研究代表者	ヒルシュベルガー マクシミリアン 東京大学 大学院工学系研究科 准教授
相手側研究代表者	Leslie SCHOOP, Professor, Department of Chemistry, Princeton University
研究期間	2024 年 12 月 1 日～2028 年 3 月 31 日

1. 研究成果の概要

① 研究構想にかかる成果 (Achievements in research progress)

<実施したこと> (What was done)

In FY2024, the joint Japan-US team initiated its collaboration and research activities. Researchers jointly discussed research plans, selected target materials, and the Japan-side synthesized new materials in the laboratory and performed X-ray scattering experiments at SPring-8 synchrotron accelerator facility (Hyogo). A manuscript was prepared in collaboration between the Japan and US sides: In LaRu_3Si_2 , a material with unconventional charge order, a zero-resistance state (superconductivity) was observed. The preprint is available online at <https://arxiv.org/abs/2503.22477> and is now under review in a journal.

<得られた成果>

A research paper supported by this JST ASPIRE program was published in FY2024. This study is relevant to energy saving devices: N.D. Khanh *et al.*, Nature Communications 16, 2654 (2025) is a study by the Japan-side. There is a press release by the Japan-side: <https://www.t.u-tokyo.ac.jp/press/pr2025-03-27-001>.

② 国際頭脳循環の促進にかかる成果 (Achievements in international exchange)

<実施したこと>

Four Japan-side students and researchers attended the annual Meeting of the American Physical Society ('APS Global Summit', Anaheim, USA). They presented oral talks to share research progress with the scientific community. Plans are being made for dispatching a researcher and a student to the USA in FY2025. Further, two Japan-side members attended the Annual Meeting of the German Physical Society ('DPG25', Regensburg, Germany) and presented oral talks there. A researcher from the US-side presented joint research at the 2024 MRS Fall Meeting & Exhibit (Boston, USA).

<得られた成果> (Results obtained)

Students and young researchers from the Japan-side laboratory have gained scientific expertise and undergone training to prepare the next experimental steps. In addition, students have gained experience by attending international conferences and presenting their research results. Through discussions within the international team, students and researchers learn to express scientific ideas in an intercultural setting (in English language). Concrete research plans could be made by detailed discussion between US-side and Japan-side team members, especially at the American Physical Society meeting.

2. 研究実施体制 (Structure of research implementation)

研究テーマ	中心となる研究者氏名	所属機関・部署・役職名
研究テーマ1	ヒルシュベルガー マクシミリアン Leslie SCHOOP	東京大学 大学院工学系研究科 Professor, Department of Chemistry, Princeton University
研究テーマ2	ヒルシュベルガー マクシミリアン Leslie SCHOOP	東京大学 大学院工学系研究科 Professor, Department of Chemistry, Princeton University
研究テーマ3	ヒルシュベルガー マクシミリアン Leslie SCHOOP	東京大学 大学院工学系研究科 Professor, Department of Chemistry, Princeton University

3. 代表的な業績（原著論文、プレスリリース、表彰など） (Major achievements)

The Japan-side researchers won prizes in FY2024 based on research supported by this JST ASPIRE program. Two students were awarded prizes for their graduation thesis. In addition, the Japan-side PI received an award for his research on topological materials (令和7年度科学技術分野の文部科学大臣表彰).