| Division of Biological Science and Technology | Research field | Bio-Sustainable Chemistry | Lab. ID BS22 |
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| Laboratory web site | https://ionicliquid.w3.kanazawa-u.ac.jp/en/index.html | | |

Research subjects

**Research Overview**

In our laboratory, we conduct interdisciplinary research that brings together chemistry and life science, using ionic liquids—especially low-toxicity zwitterionic liquids—as our core technology. What truly sets our lab apart is that we design and create new solvent molecules ourselves, and then use them to explore chemical and biological applications that have not been achievable with conventional solvents. Rather than extending existing technologies, our research starts from creating the solvent itself, which makes this laboratory a particularly exciting place for students who enjoy building things from the ground up. Our main research topics are outlined below.

**■ Bioethanol Production from Plant Biomass (Cellulose)**

Cellulose is a renewable resource with great potential, but it is extremely difficult to dissolve and utilize efficiently. In our laboratory, we design low-toxicity ion liquids at the molecular level that can dissolve cellulose under mild conditions. Using these original solvents, we aim to establish a new bioethanol production process in which pretreatment, enzymatic reactions, and microbial fermentation are carried out sequentially in a single vessel. This research directly addresses energy and environmental challenges while also offering the depth and excitement of fundamental molecular design.

**■ Solubilization of Poorly Water-Soluble Pharmaceuticals**

Many drug candidates with high pharmacological activity are unfortunately abandoned simply because they do not dissolve well in water. In this research theme, we tackle this problem by designing solvent molecules specifically for each purpose. Seeing molecules that you have personally designed and synthesized open up new possibilities in drug discovery is a rewarding experience, and this topic clearly demonstrates how fundamental chemistry can connect to real medical applications.

**■ Cryopreservation of Cells and Proteins**

Cells and proteins are easily damaged during freezing and thawing, which remains a major challenge in biotechnology and medicine. In our laboratory, we are developing novel cryopreservation techniques using low-toxicity zwitterionic liquids, with the goal of establishing core technologies that support cell-based therapeutics and regenerative medicine. One of the key attractions of this topic is the opportunity to learn across disciplines, from molecular design and physical properties to biological evaluation.

Master/Doctor course: Education policy, curriculum, typical activity in the laboratory

Each student pursues an independent research topic and is encouraged to be a leader of their project. In the master's program, the main goal is to publish one international research paper, while doctoral students aim to publish three international papers. Although these are ambitious goals, we provide close and continuous support at every stage—from developing research plans to writing papers and giving presentations—and many students successfully achieve these targets before graduation. Students are also strongly encouraged to attend domestic and international conferences, making our laboratory an environment where you can gain broad experience and grow as an independent researcher.

Daily life in the laboratory, etc.

In our laboratory, we value the idea of fully enjoying both research and everyday life. Along with working seriously on research projects, we also place importance on communication and interaction within and beyond the laboratory.

These are Japanese but you may read it by translation.
https://ionicliquid.w3.kanazawa-u.ac.jp/futurestudents/page11/shimada.html
https://ionicliquid.w3.kanazawa-u.ac.jp/futurestudents/page12/sakai.html

Message or comments by the laboratory faculty staffs

If you are someone who wants to create something with your own hands and take on challenges that no one has tackled before, this laboratory may be the right place for you. Research topics can be partly designed with your wish rather than being fully fixed in advance. We offer an environment where you can grow by aiming for ambitious goals and learning from occasional setbacks along the way. We provide careful guidance on research projects, experiments, and presentations, so there is no need to worry if you feel unsure at first. If the idea of working on "your own unique molecule" sounds exciting to you, we would be very happy to explore science together.

| Laboratory mail address | kkuroda at staff.kanazawa-u.ac.jp (please replace "at" with "@".) |
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