Division of Electrical, Information and Communication Engineering	Research field	Fundamentals and Applications of Plasmas	Lab. ID EI14
Laboratory web site	http://epel.w3.kanazawa-u.ac.jp/		

Research subjects

We have studied fundamentals and applications of different types of plasmas: from high-density high heat flux plasmas to low-density low power density plasmas for their next generation applications. The research subjects are described as follows:
1. High-density high temperature plasma for advanced applications ---- In this field, we have studied on new developments of different types of inductively coupled thermal plasmas and their applications to materials processings such as high-speed surface modification, ultra-rapid film deposition, large-scale nanopowder synthesis. Arc/ thermal plasma quenching properties are also subjects using polymer ablation/spallation for circuit breakers. A multi-phase plasma is one keyword for innovative advanced applications with solid, liquid, gas and plasma phases.
2. High-pressure non-equilibrium plasma application to industrical innovation ----- In this field, we are interested in developing novel applications three kinds of plasma sources such as a novel high-density non-equilibrium plasmas by microwave excitation using liquid as source gas, a dielectric barrier discharge using rotary electrodes, and a plasma jet type using a low frequency and microwave power sources. These can be applicable for materials processing suitable at low-temperature environment and also will provide innovation for nano, bio, and medical applications as well as semiconductor fabrication process.
3. Low-pressure arc plasma ---- The vacuum arc plasma is receiving great attention in the switching arcs, and vacuum deposition etc. We are developing a new technique to simulate the behavior of vacuum arc by the particle method. In addition, experimental approach for vacuum arcs has been done using two-dimensional spectroscopy and current and voltage control for arcs by semiconductor switching.
4.Study on the electrical insulation properties of high-temperature gases ---- We are investigating the electrical insulation characteristics of high-temperature gases by introducing insulating gases into inductively heated plasma to achieve high temperatures and measuring the discharge voltage across a gap, with the aim of exploring SF_6 alternative gases.

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

Experiemntal and numerical appoarches in high-density plasmas and low-pressure non-equilibium plasma technologies in our laboratory offer you big opportunities to learn electrical/electronic circuits, control theories, electromagnetic field, fluid dynamics, chemical reactions, atomic and molecular theories, thermodynamics, spectroscopic theories, as well as plasma physics and technologies. Programming can be done to simulate hydrodynamics of plasmas and also for signal processings.

Daily life in the laboratory, etc.

Students in our laboratory can learn experimental and numerical simulation approaches to plasma technologies from designs of plasma devices, measurement systems, programming for plasma fluid dynamics. We have a meeting about our reasearch progresses to discuss solutions for the next step. In addition, we have a weekly interactive lecture to learn fundamentals of plasma physics to enhance the abilities of all colleagues and students. Introduction of recent journal paper about plasma technologies by each of members provides recent knowledgements to everyone in our laboratory. We welcome to have collaboration works with some companies to know industrial needs to be solved.

Message or comments by the laboratory faculty staffs

We have cordially been welcoming for members who would like to study and progress our subjects about plasma physics and plasma application together with us.

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