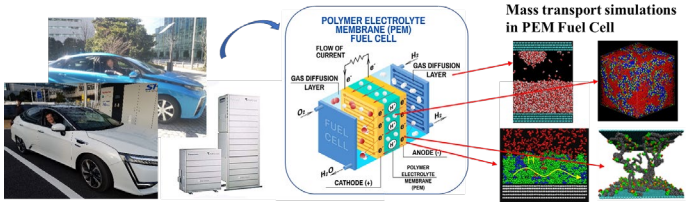
Tokumasu Lab.

Finemechanics course Institute of Fluid Science

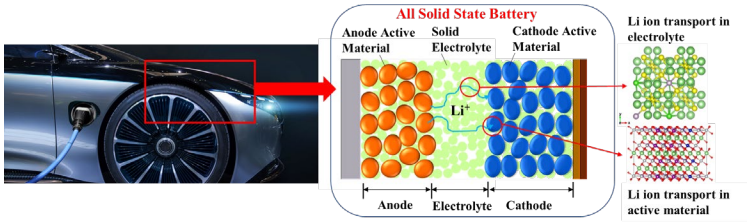
Fuel Cell Group

Fuel cells have begun to spread as the environmentally friendly and highly efficient energy sources. In the future, it is necessary to analyze mass transport mechanism inside the fuel cell for the development with high efficiency, high durability, and low cost. In this research group, we analyze the transport phenomena of hydrogen (proton), oxygen, and water in nano-microscale structures of polymer electrolyte membranes and catalyst layers in fuel cell by molecular simulation, and the knowledge is used to improve the next-generation fuel cells.



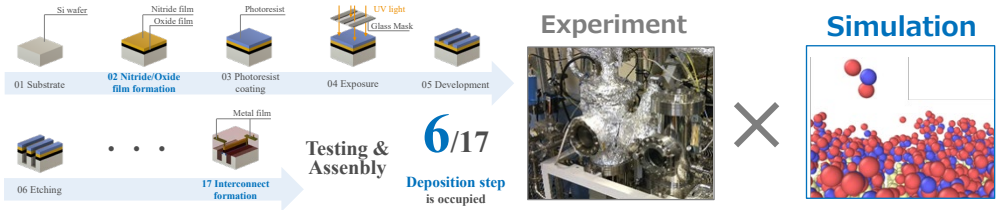
Secondary Battery Group

Li-ion batteries are widely used in automobile batteries and smartphones, but they have problems such as flammability and long charging time. All solid state batteries in which the liquid electrolyte of a Li-ion battery is replaced with a solid electrolyte are attracting attention as a technology for solving the disadvantages of this conventional Li-ion battery. In this research group, we analyze the transport phenomenon of Li ions inside the solid electrolyte and the active materials of positive and negative electrodes by molecular simulation.



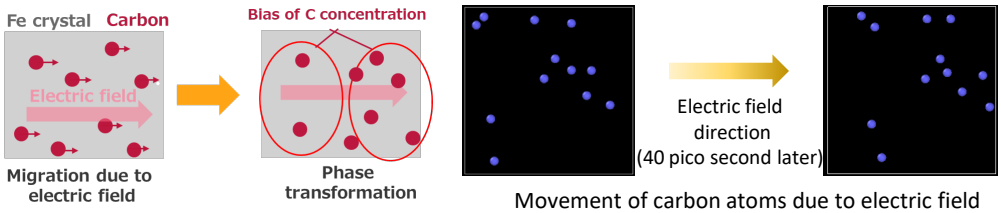
Semiconductor Group

Semiconductors are installed in everything around us, such as automobiles and electronic devices. Their importance is increasing year by year. In semiconductor manufacturing, the deposition step requires ultra-high precision control with a film thickness error of ± 0.5 nm. This research group is tackling to create next-generation material development technologies centered on semiconductor materials by both of experiments and simulations.



Steel Group

Reducing greenhouse gas emissions generated in the manufacturing process is very effective to curb global warming. Heat treatment processes using Joule heat are studied in our laboratory. During this process, not only thermal diffusion but also migration by electric field and phase transformation of steel occur. Therefore, multiphysics analysis combining molecular fluid engineering and materials science is used to try to elucidate the mechanism.



In our Lab, large scale numerical simulations are performed to analyze reaction and fluid properties using a super computer.

Prof.
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