Tokumasu & Mabuchi Lab.

Finemechanics course Institute of Fluid Science

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

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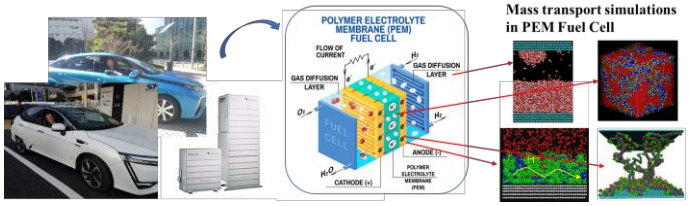
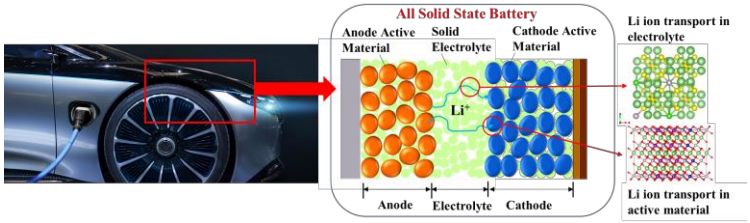
Fuel Cell Group

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.



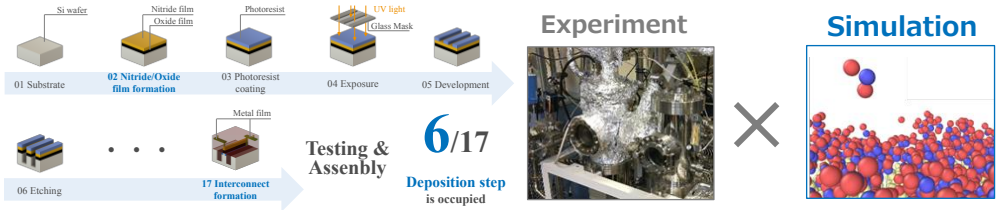
Rechargeable Battery Group

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.



Biomolecular Sim. Group

The research involves theoretical and computer simulation studies of biomolecular systems. Current research activities span both development of new computational methods and theoretical characterization of proton transport and protein phase behavior in biomolecular systems at multiple length scales. Our research is thus often carried out in close collaboration with leading experimentalists and is integrated in a feedback loop with experiments.