Frontier Chemistry Center フロンティア化学教育研究センター 講演会

演 題：**Frontier Engineering of Solid-State Li-Ion and Metal-Air Batteries for High-Energy-Density Storage**

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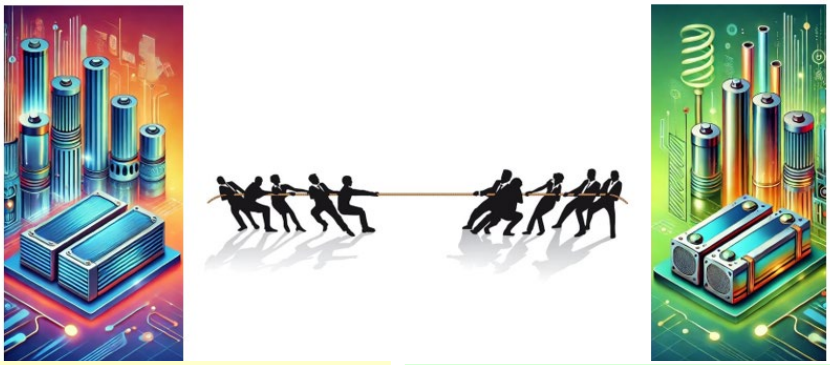
日 時：2026 年 6 月 23 日（火）14:30～15:30

場 所：工学部 材料・化学系棟 5 階大会議室（MC526）

要 旨：Achieving carbon neutrality by 2050 requires a rapid transition to renewable energy supported by advanced energy storage technologies. Conventional lithium-ion batteries (LIBs) have reached a practical energy density limit of ~300 Wh kg^{-1}, driving the development of solid-state lithium-ion batteries (SSLBs) targeting >500 Wh kg^{-1}. Central to SSLBs is the solid-state electrolyte, which critically determines ionic conductivity and interfacial stability. This work highlights recent advances in electrolyte materials and interface engineering. Meanwhile, rechargeable metal–air batteries have emerged as promising candidates due to their ultra-high theoretical energy densities and compatibility with carbon-neutral cycles. Here, we provide a comparative perspective on SSLBs and metal–air systems, addressing their mechanisms, challenges, and prospects for next-generation energy storage.



• Solid-state lithium-ion batteries use solid electrolytes instead of traditional liquid electrolytes, which is expected to significantly improve the safety and energy density of batteries. However, solid-state batteries still face challenges in terms of cost and industry chain maturity.

• The theoretical energy density of metal-air batteries is extremely high, and they are expected to break through the current energy density bottleneck of lithium-ion batteries. However, there is still room for breakthroughs in terms of cycle life and charging speed.

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