

The 126th GREEN Seminar



Advancing Energy Storage and Electrochemical CO₂ Capture in Porous Materials

Chair: Dr. Ken Sakaushi (GREEN)

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Energy storage and carbon dioxide capture will both play an important role in mitigating climate change. Supercapacitors are high power energy storage devices that will complement batteries in an increasingly electrified future. In this presentation we will discuss a key question in supercapacitor research – how does electrode structure determine supercapacitor performance? I will show how NMR spectroscopy measurements and simulations can be used to find new answers to this question. Contrary to the traditional theory that carbon pore size is the key lever to improve capacitance, we instead find that instead structural disorder in the carbon electrodes correlates strongly with energy storage performance.

I will then present work on electrochemically driven carbon dioxide capture by energy storage devices - a new approach that can bring energy-efficient carbon capture compared to existing amine-based technology. I will show that aqueous supercapacitors capture CO₂ during charging through a reversible electrochemical process, and that they have promising energy efficiencies and stability to oxygen (essential for most CO₂ capture applications). Our studies on the mechanism of this process suggest that CO₂ capture is driven by bicarbonate migration during charging, with a complex interplay between kinetic and thermodynamic effects, and we suggest strategies to enhance electrochemically driven CO₂ uptake.

Venue: Auditorium, 1F, NanoGREEN/WPI-MANA Bldg.,
Namiki-site

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