

SEMINAR SERIES

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Electrolytes for high energy Li-ion and Li metal batteries

Electrolytes are critical enabling components for Li-ion batteries to safely operate within a wide temperature range, under extreme fast charging, and under intense abuse conditions without sacrificing energy density and cycle life. Current electrolytes cannot satisfy these requirements. We developed advanced all-fluorinated electrolytes, water-in-salt (WIS) electrolytes and solid-state electrolytes aiming to simultaneously enhance cell energy density and safety. Guided by the electrolyte design principle for high-capacity electrodes with large volume changes, we developed several organic liquid electrolytes suitable for micro-sized Si and Li metal anodes and NMC cathodes. We also reduced the salt concentration of water-in-salt electrolytes from 21 m to 4.5m and extended the electrochemical stability window from 3.0V of WIS to 3.4V. These improved electrolytes enable LiMn₂O₄/Li₄Ti₅O₁₂ pouch cells with an areal capacity of 2.5 mAh/cm² and a P/N capacity ratio of 1.14 to achieve a long cycle life of 500. For solid state electrolyte Li metal batteries, we suppressed the Li dendrite growth and reduced the interface resistance by constructing a lithiophobic-lithiophilic interlayer between solid electrolyte and Li metal anodes. The critical role of solid electrolyte interphase in accommodating electrode volume changes was also investigated.



**Wednesday
Sept. 22 @ 2:30p.m.
Mudd Hall, Rm 26**

**For Zoom Info
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