Reading Notes: Professor Weilai Yu's REI Viewpoint and Lecture Reflections

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Today, I had the privilege of attending Professor Weilai Yu's lecture in person, which focused on his latest research progress in the field of electrochemical interfaces. Following the lecture, I revisited his recently published Viewpoint article[1] in *Accounts of Materials Research* (DOI: 10.1021/accountsmr.6c00033) titled **"Reactive Electrochemical Interphases (REI) as Active Materials: From Passive to Programmable Interfaces"**.

The high degree of resonance between the lecture and the article left a profound impression on me. The cutting-edge experimental results shared during the talk, the reconstruction of core concepts, the in-depth analysis of key experimental phenomena, and even his personal academic perspectives that naturally surfaced during the Q&A session perfectly mirrored the logical framework and key takeaways of the paper. This demonstrates that a cognitive system, built upon long-term, firsthand experimental observation and repeated validation, has now been highly systematized and elevated.

This Viewpoint is essentially a deep internalization and milestone summary of the author's research trajectory. It integrates scattered experimental insights, lessons from failures, and profound thoughts to redefine the traditionally static, "passive" solid-electrolyte interphase (SEI) into a dynamic, "programmable active material," thereby constructing a complete and self-consistent cognitive map. Inspired by both the lecture and the reading, I also gained new insights into the macro-patterns of scientific breakthroughs. Major scientific breakthroughs often take different forms. Some are relay leaps achieved by top teams "concentrating resources for big goals"; others are more like a long puzzle pieced together bit by bit. In the latter scenario, many seemingly small discoveries might initially only be published in journals with limited impact. But when these fragments accumulate to a critical point, they catalyze a milestone cognitive leap. In fact, clues to such breakthroughs can often be found in earlier fundamental work, just not yet systematically connected. Prof. Weilai Yu's Viewpoint and lecture are a vivid reflection of this pattern: by organizing and elevating a massive amount of previous experimental observations, he clearly outlined the cognitive leap for me.

This academic exchange also prompted me to re-examine my own research habits, establishing two points of self-reflection:

1. **Maintain the "Just Show Up" Proactivity:** Never miss a high-level academic exchange opportunity. You never know which clash of ideas might bring the exact inspiration needed to break through a research bottleneck.
2. **Elevate the Quality and Depth of Q&A:** Hold myself to strict standards during Q&A sessions. Discard casual or superficial questions, and strive to ask high-quality, constructive questions that truly advance the topic's discussion and overall research progress.

Lecture Q&A Review (Three Core Themes)

- **Theme 1: The Correlation Between the Dissolution Transition Layer and the Macroscopic SEI Structure** Exploring how the composition of the "semi-soluble transition layer" near the REI/SEI profoundly influences the formation mechanisms and spatial evolution of classical SEI structural models (e.g., the mosaic model, the multilayer model).
- **Theme 2: Electrochemical Mapping of 2D Structural Nucleation Dynamics** Discussing how to inverse or map the 2D structural evolution characteristics of interfaces like Cu-SEI through the nucleation patterns observed in potentiostatic chronoamperometry (I-T curves).
- **Theme 3: Closed-Loop Verification of Theoretical Calculations and Experimental Characterization** Discussing how to strategically design and introduce other advanced experimental characterization techniques to form a rigorous "theory-experiment" cross-validation system, building upon the use of Density Functional Theory (DFT) to reveal electrolyte decomposition pathways.

References

1. Yu, W. Reactive electrochemical interphases (REI) as active materials: From passive to programmable interfaces. *Acc. Mater. Res.* **7**, 220–222 (2026).