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High-Throughput and Local Probing of Electrochemical Interfaces

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Two central challenges in electrochemical science are understanding how the structure and composition of electrode materials govern reactivity and performance, and efficiently identifying optimal process conditions across vast experimental spaces. Addressing these challenges is key to accelerating progress in the development of technologies for energy conversion and storage, catalysis, and sensing.

In this talk, I will show how scanning electrochemical cell microscopy (SECCM), particularly when integrated with complementary characterization techniques, offers a powerful approach to meet both needs. SECCM enables electrochemistry to be resolved at the micro- and nanoscale, [1,2,3] revealing hidden local structure-function relationships and capturing dynamic interfacial transformations. Simultaneously, its automated, high-throughput capabilities facilitate rapid combinatorial screening of experimental conditions. [4,5] In essence, SECCM can accelerate mechanistic understanding and support the rational design of functional electrode materials. This modern, data-rich perspective opens new avenues for addressing critical scientific challenges in electrochemical technologies and lays the groundwork for more intelligent, even autonomous exploration, of electrochemical interfaces.

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