

Pipets as Tools for Imaging Chemical Reactivity at the Single Nanoparticle Level

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Metallic and semiconducting nanoparticles (NPs) are attractive platforms for a variety of applications in catalysis, energy conversion, and sensing. Unfortunately, the complex, heterogeneous nature of these systems makes it difficult to elucidate how different chemical, electronic, and morphological factors impact their performance. In this presentation, it will be shown how Scanning Electrochemical Cell Microscopy (SECCM), which utilizes electrolyte-filled pipets as high-resolution probes, can be used to characterize the chemical behavior of individual NPs. First, studies will be presented which employ correlated SECCM and electron microscopy measurements to enable key structural factors controlling reactivity to be identified for shape-controlled colloidal NPs and high entropy alloy systems. Experiments will also be presented which leverage SECCM as a powerful, instantly reconfigurable tool for the fabrication of ordered NP arrays. Together, these studies demonstrate the utility of electrochemical microscopy techniques for fundamental studies into the chemical properties of discrete, nanoscale chemical entities.