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Innovative SPM Probes for Energy-Storage Science: MWCNT-Nanopipettes to Nanobattery Probes[1] JONATHAN LARSON, Dept. of Physics, Univ of Maryland-College Park, ALEC TALIN, Dept. of Mat Physics, Sandia National Labs-Livermore, ALEXANDER PEARSE, Dept. of Mat Sci Eng, Univ of Maryland-College Park, ALEXANDER KOZEN, Dept of Mat Sci Eng, Univ of Maryland-College Park, JANICE REUTT-ROBEY, Dept. of Chem and Biochem, Univ of Maryland-College Park — As energy-storage materials and designs continue to advance, new tools are needed to direct and explore ion insertion/de-insertion at well-defined battery materials interfaces. Scanned probe tips, assembled from actual energy-storage materials, permit SPM measures of local cathode-anode (tip-sample) interactions, including ion transfer. We present examples of "cathode" MWCNT-terminated STM probe tips interacting with Li(s)/Si(111) anode substrates. The MWCNT tip functions as both SPM probe and Li-nanopipette,[1] for controlled transport and manipulation of Li. Local field conditions for lithium ionization and transfer are determined and compared to electrostatic models. Additional lithium metallic and oxide tips have been prepared by thin film deposition on conventional W tips, the latter of which effectively functions as a nanobattery. We demonstrate use of these novel probe materials in the local lithiation of low-index Si anode interfaces, probing local barriers for lithium insertion. Prospects and limitations of these novel SPM probes will be discussed. [1] J.M. Larson et al, Small, 2015, DOI: 10.1002/smll.201500999

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