Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Materials

New insights from in-situ electron microscopy into capacity loss mechanisms in Li-ion batteries with Al anodes

Marina S. Leite[1,,2,3], Dmitry Ruzmetov[2,3], Zhipeng Li[4], Leonid A. Bendersky[4], Norman C. Bartelt[5] Andrei Kolmakov[2], and A. Alec Talin[2,5*]*

[1]Department of Materials Science and Engineering, Institute for Research in Electronics and Applied Physics, College Park, MD 20742-2115, USA

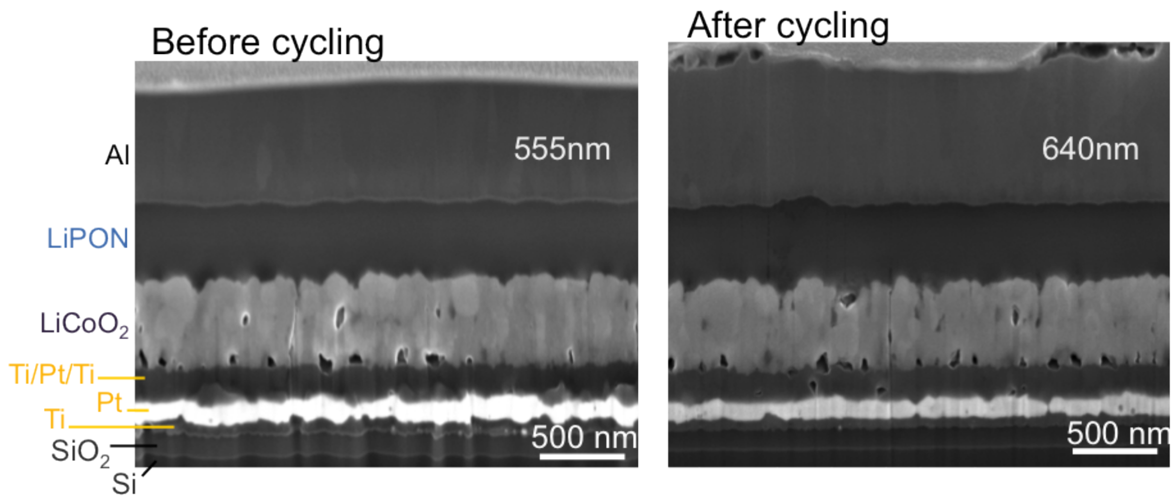
[2]Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD, USA

[3]Maryland NanoCenter, University of Maryland, College Park, MD, 20899-6204, USA

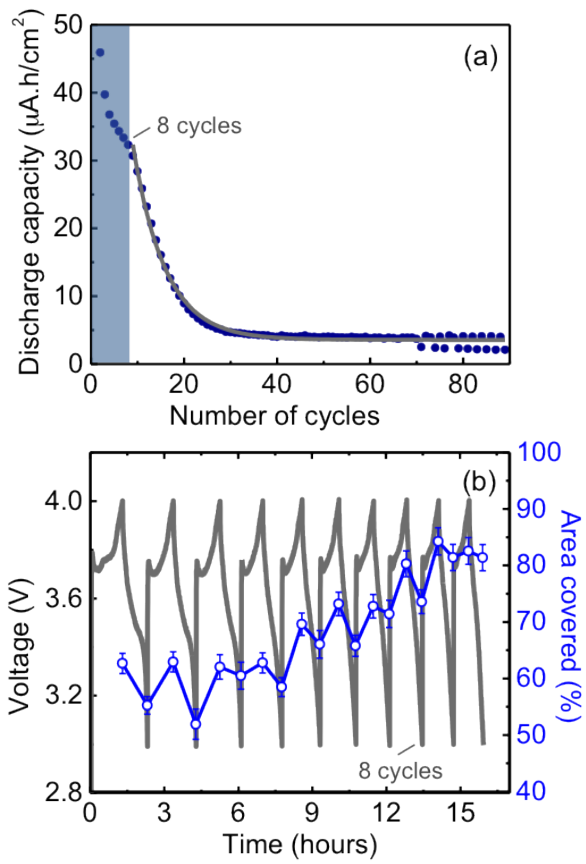
[4]Material Measurement Laboratory, NIST, Gaithersburg, MD, USA

[5]Sandia National Laboratories, Livermore, CA, USA

*Corresponding Authors: mleite@umd.edu, aatalin@sandia.gov



Supporting Figure S1: Cross-section SEM images of Al anode battery before and after 10 cycles. After cycling, the thickness of the anode expands in ≈ 16 %. Detector: TLD, 5.0 keV, beam current: 10 nA).



Supporting Figure S2: (a) Discharge capacity as a function of number of cycles at 10 nA. (b) Galvanostatic cycling overlaid by area percentage covered with Li-Al cluster after 10 cycles at 30 nA.

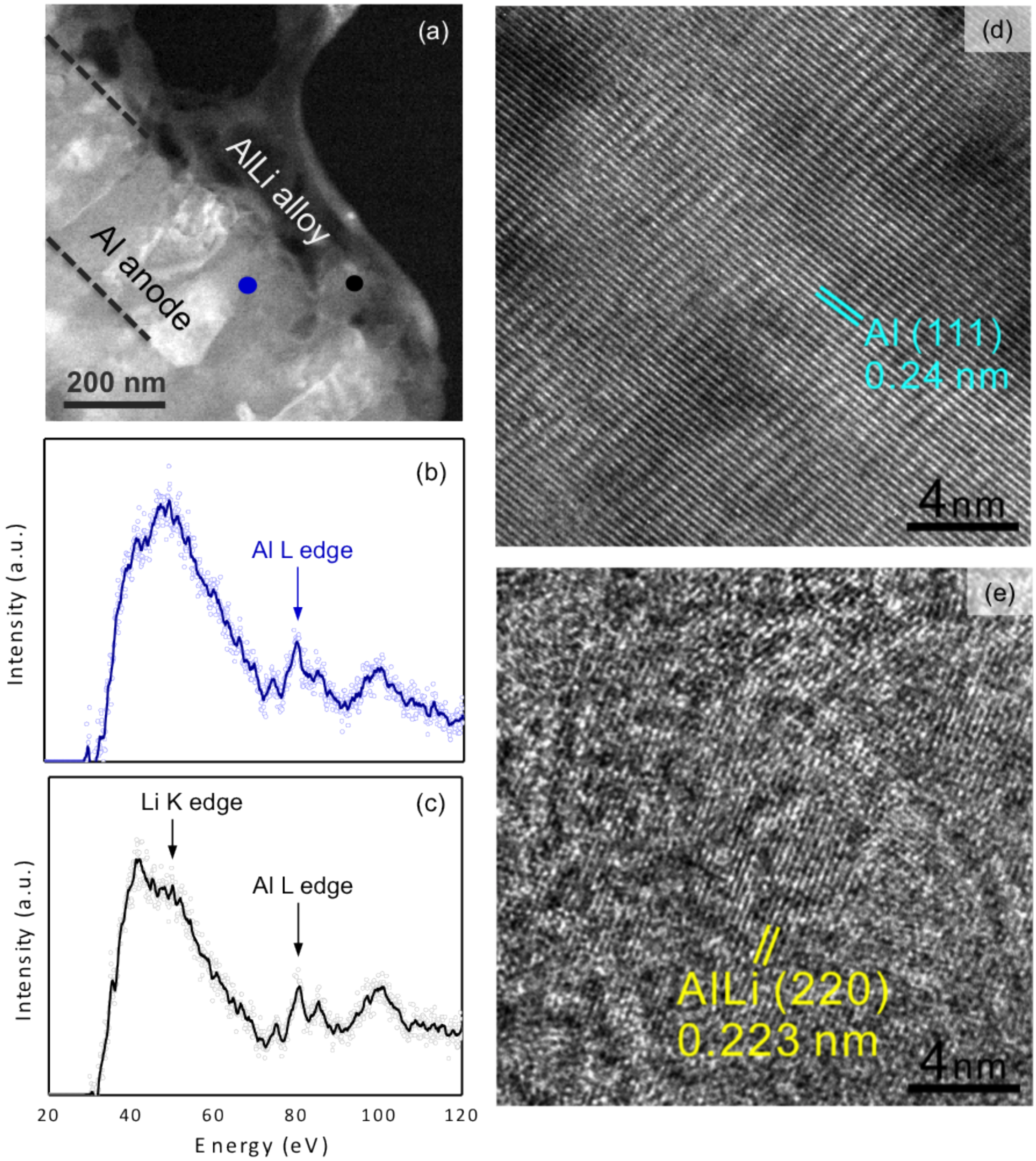


Figure S3: (a) STEM dark image of the Al-Li cluster (darker contrast) on Al anode (brighter contrast). EELS spectra taken from (b) Al anode and (c) Al-Li cluster at the positions indicated in the STEM image shows only Al L-edge for (b) and both Al L-edge and Li K-edge for (c). Atomic resolution TEM images of (d) Al anode and (e) Al-Li cluster with identified lattice fringes nanoscale crystals.