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

Supporting Information

Facile Synthesis of Micrometer-Long Antimony Nanowires by Template-Free Electrodeposition for Next Generation Li-ion Batteries

R. Al-Salman,[a*] S. J. Sedlmaier,[a] H. Sommer,[ab] T. Brezesinski[a*] and J. Janek[ac]

[a]Battery and Electrochemistry Laboratory, Institute of Nanotechnology, Karlsruhe Institute of Technology, Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany.

[b]BASF SE, 67056 Ludwigshafen, Germany.

[c]Institute of Physical Chemistry, Justus-Liebig-University Giessen, Heinrich-Buff-Ring 17, 35392 Giessen, Germany.

[*]torsten.brezesinski@kit.edu, phone: +49 721 608 28827

[*]rihab.al-salman@kit.edu, phone: +49 721 608 23574

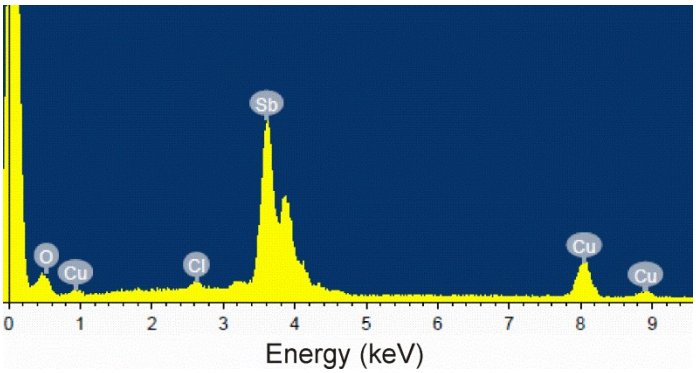

Fig. S1 EDX analysis of the Sb deposit from 0.5 M $SbCl_3$/BMP-TFSI solution on Cu electrode at –1.7 V *vs*. Pt quasi-reference electrode.

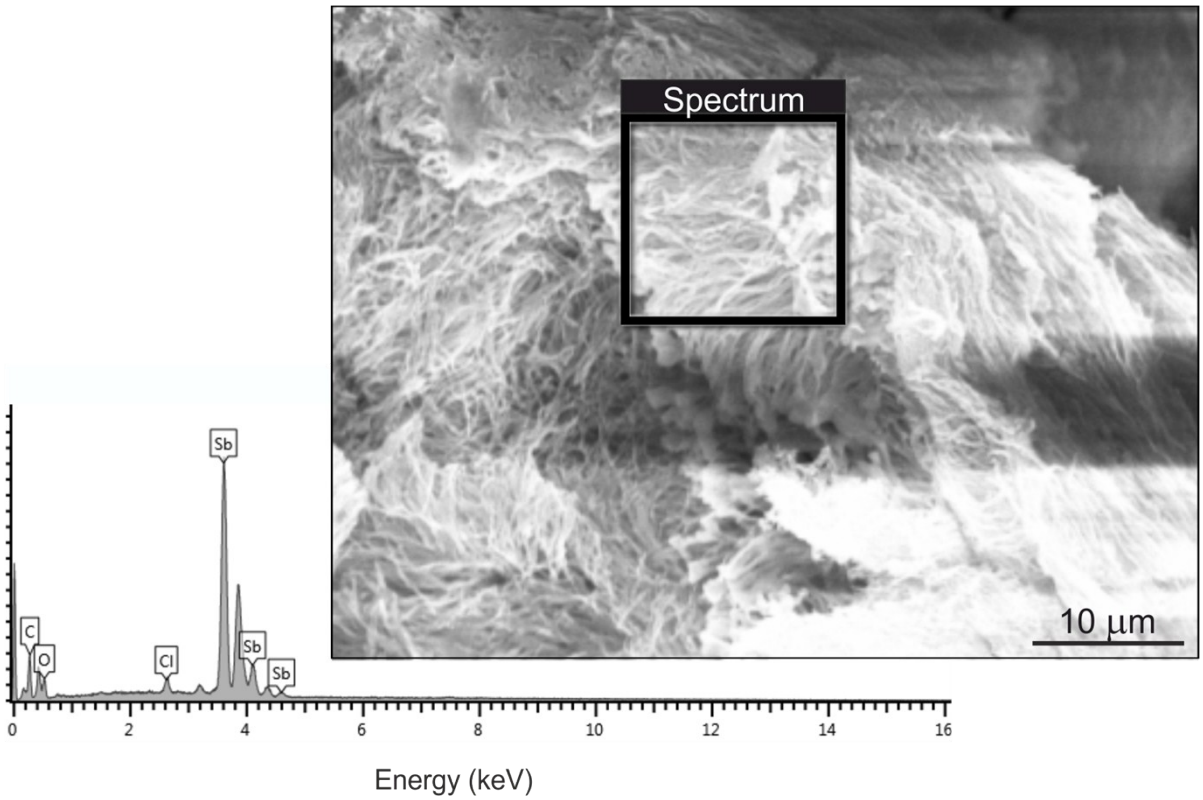

Fig. S2 EDX analysis of the Sb deposit from 0.5 M $SbCl_3$/0.1 M $GaCl_3$/BMP-TFSI solution on glassy carbon electrode. The area from which the spectrum was recorded is also shown in the figure. Aside from Sb, only small residuals of C, O and Cl are detected. This indicates that Ga co-deposition can be ruled out at a potential of –1.9 V *vs*. Pt quasi-reference electrode. Similar results were also obtained for Sb NWs on Cu electrode.

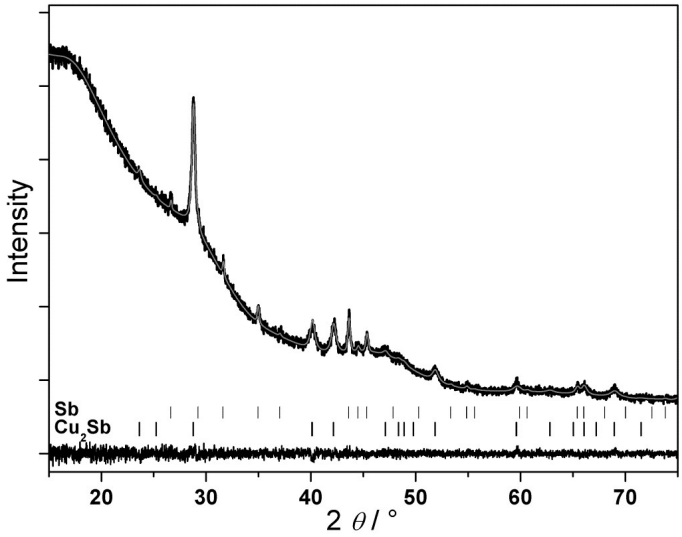

Fig. S3 Observed (black line) and calculated (grey line) powder XRD patterns (Cu-Kα1, 1.5406 Å) of as-prepared Sb NWs (*R*3*m*, *a* = 4.2803(10) Å, *c* = 11.274(4) Å) and the alloy Cu_2Sb (*P*4/*nmm*, *a* = 3.9946(8) Å, *c* =6.097(2) Å) as well as difference profile of the fit. Reflection positions of the respective phases are indicated by vertical lines. The deposit was obtained from 0.5 M $SbCl_3$/0.1 M $GaCl_3$/BMP-TFSI solution on Cu electrode at –1.9 V *vs*. Pt quasi-reference electrode.

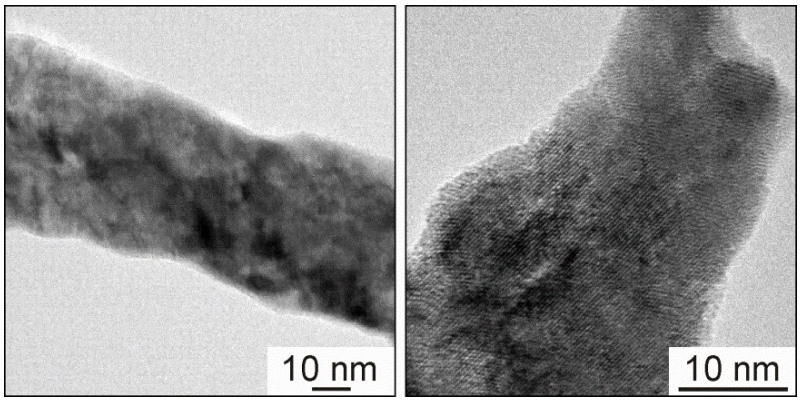

Fig. S4 High-resolution TEM of Sb NWs demonstrating the high degree of crystallinity. The presence of a thin amorphous surface layer is also evident from the images.

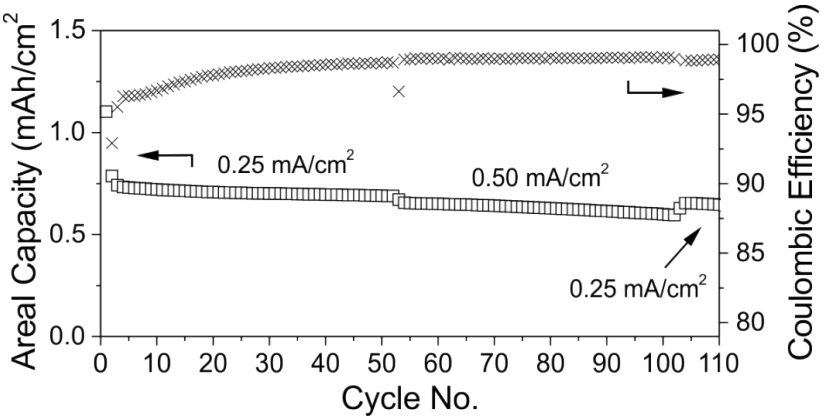

Fig. S5 Capacity retention and Coulombic efficiency of Sb NW electrodes in Li cells. The first two cycles were performed at 0.05 mA/cm^2 and then the current density was increased to 0.25 mA/cm^2 and 0.50 mA/cm^2, respectively, for the subsequent cycles. As evident, the Sb NW electrodes exhibit good Li-storage performance. These results were achieved with a non-optimized electrode structure, thus indicating that the material holds promise for application in next generation Li-ion batteries.