Electronic Supplementary Material (ESI) for CrystEngComm.


# Supporting Information
# for
# Single Crystal Ferroelectric AlScN Nanowires

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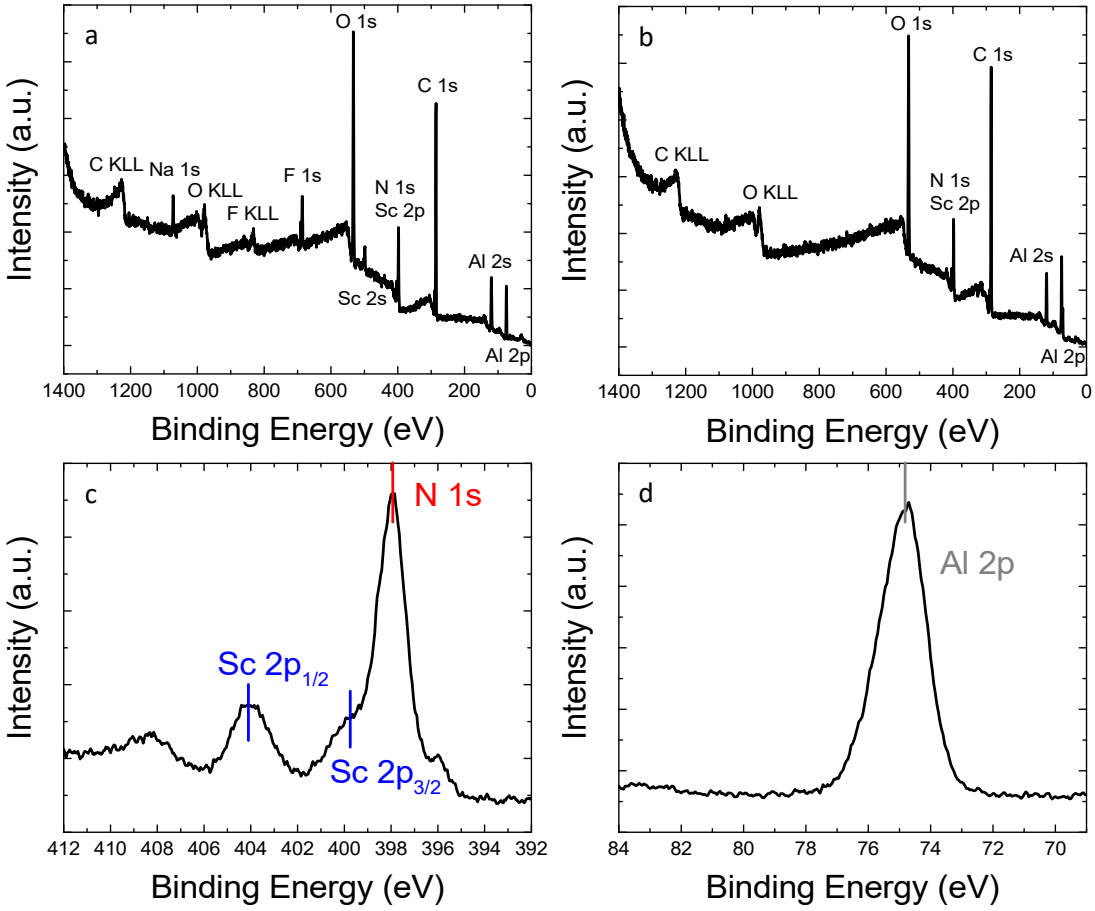


Figure S1. XPS survey scans of a) low and b) high Sc concentration AlScN nanowires as-grown on TiN(111) buffered Si(111) substrates; high resolution scans in the region of c) N 1s (~ 398 eV) and Sc 2p (~400, 404 eV) and d) Al 2p (~75 eV) absorption edges.

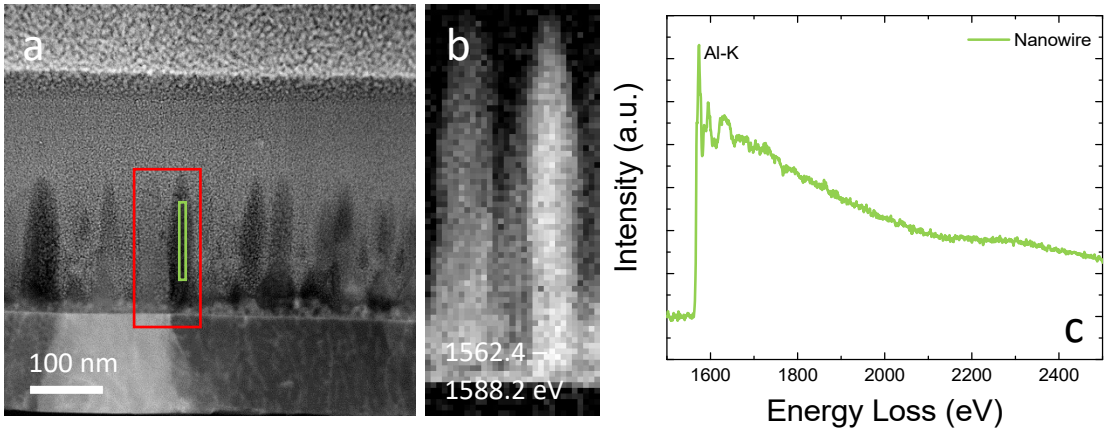


Figure S2. a) AlScN nanowire STEM image; b) Al-K absorption edge Electron Energy Loss Spectroscopy (EELS) map; c) EELS spectrum from the green (nanowire) region of interest shown in a).

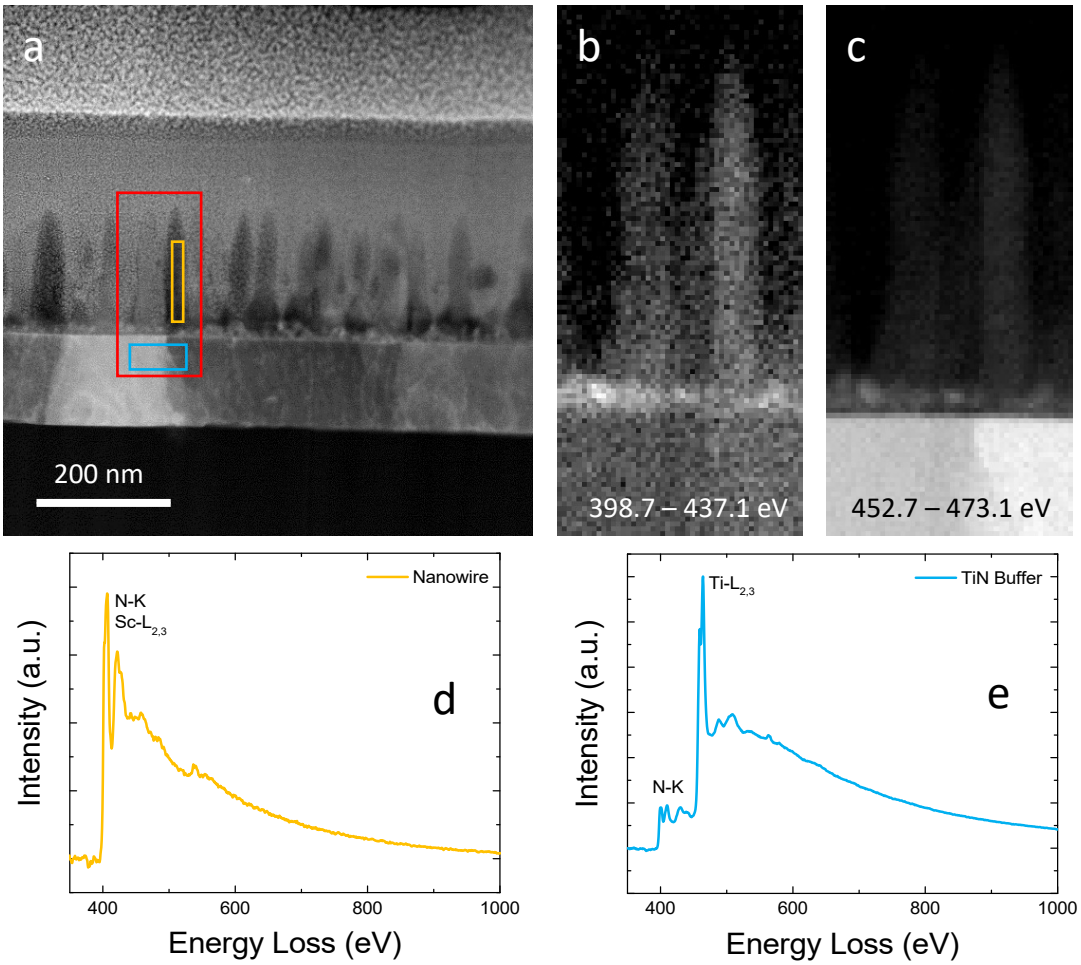

Figure S3. a) AlScN nanowire STEM image; b) N-K and Sc-L and c) Ti-L Electron Energy Loss Spectroscopy (EELS) maps; EELS spectra from d) orange (nanowire) and e) blue (TiN buffer) regions of interest shown in a).

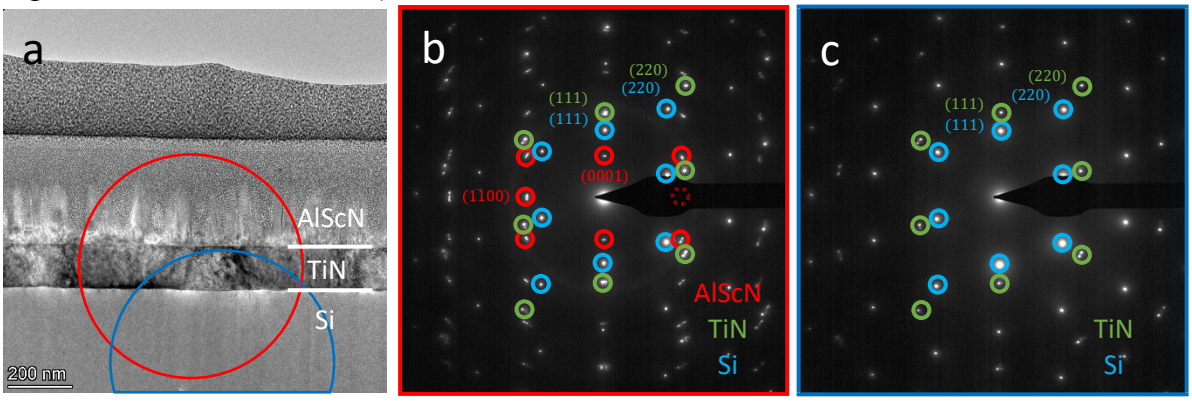


Figure S4. a) TEM image of AlScN nanowires on TiN(111) buffered Si(111); Selected Area Electron Diffraction (SAED) from b) red and c) blue regions of interest shown in a).

PFM hysteresis measurements were performed to verify the ferroelectric behavior of AlScN nanowires. In these measurements, response of piezoresponse amplitude and piezoresponse phase to a low frequency sweeping voltage give rise to a butterfly curve and a hysteresis loop, respectively, if the material is ferroelectric, with the qualifying note that non-ferroelectric materials can give rise to similar behavior due to ionic conductivity or surface charge effects. We show PFM hysteresis from nanowires (Figs. S5-6) and from a glass slide (non-ferroelectric control sample) to show piezoresponse consistent with ferroelectricity in the nanowires and a lack of piezoresponse in the control.

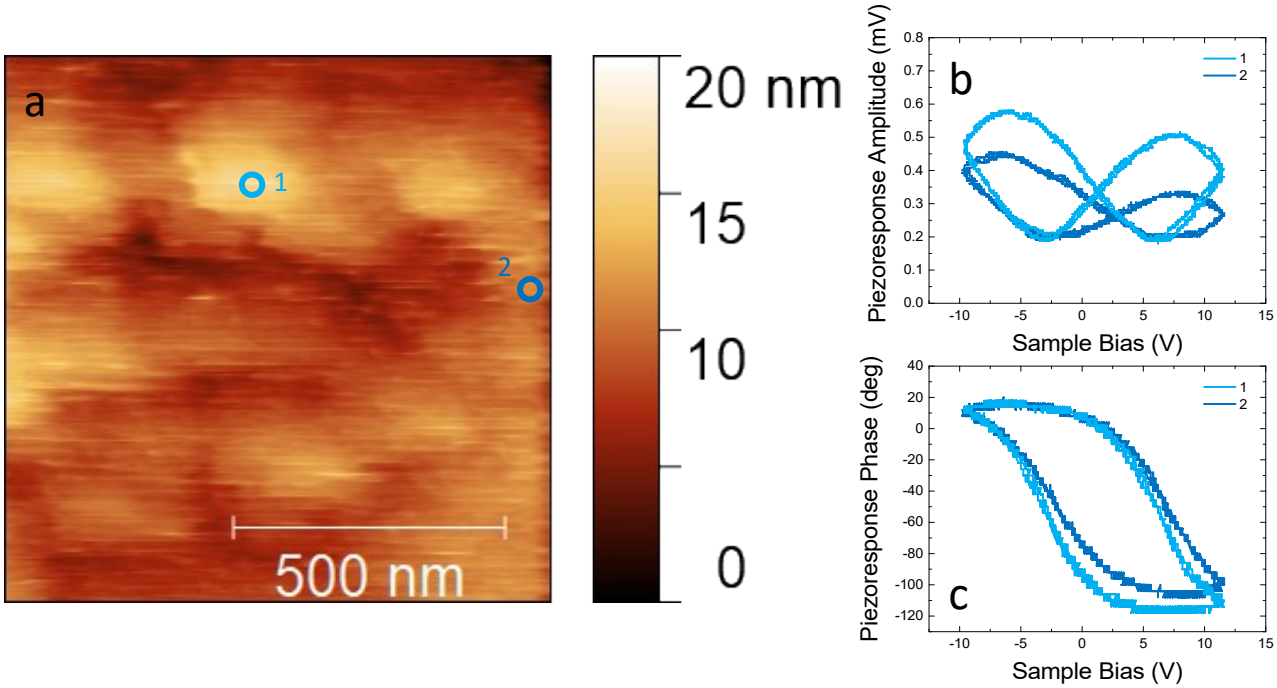

Figure S5. a) AFM topographical map of low Sc concentration AlScN nanowires; b) piezoresponse amplitude and c) piezoresponse phase hysteresis from regions 1 and 2 shown in a).

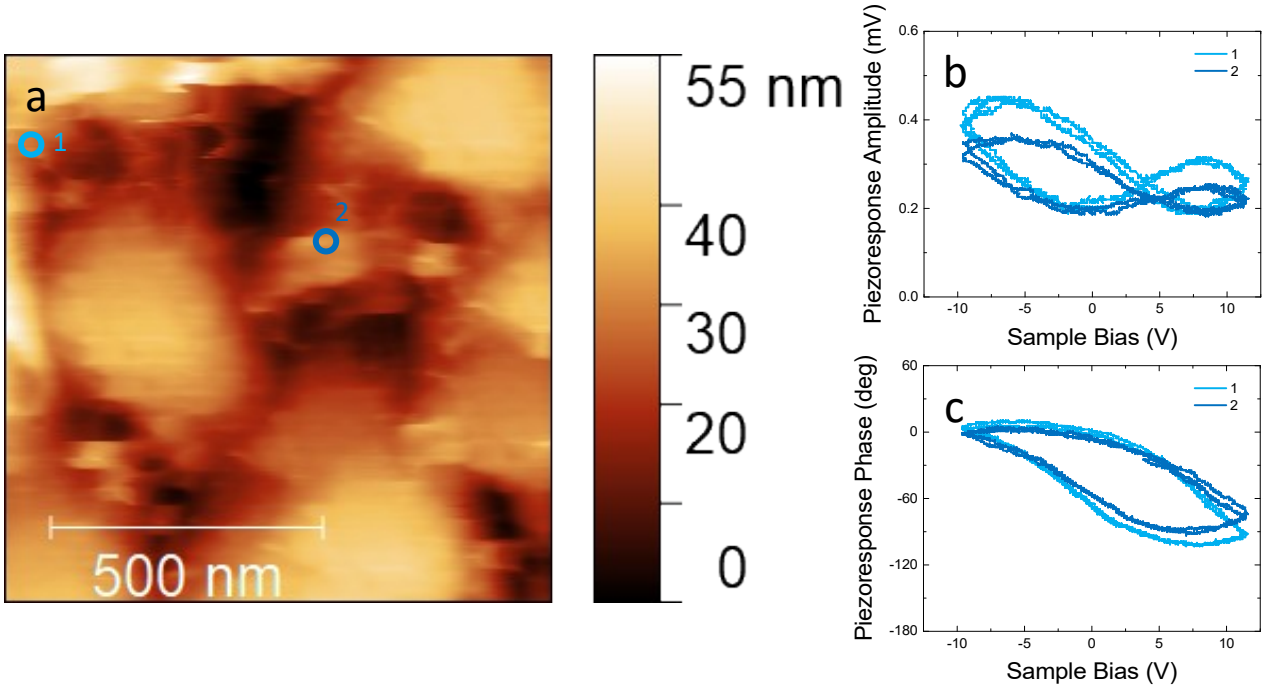


Figure S6. a) AFM topographical map of high Sc concentration AlScN nanowires; b) piezoresponse amplitude and c) piezoresponse phase hysteresis from regions 1 and 2 shown in a).

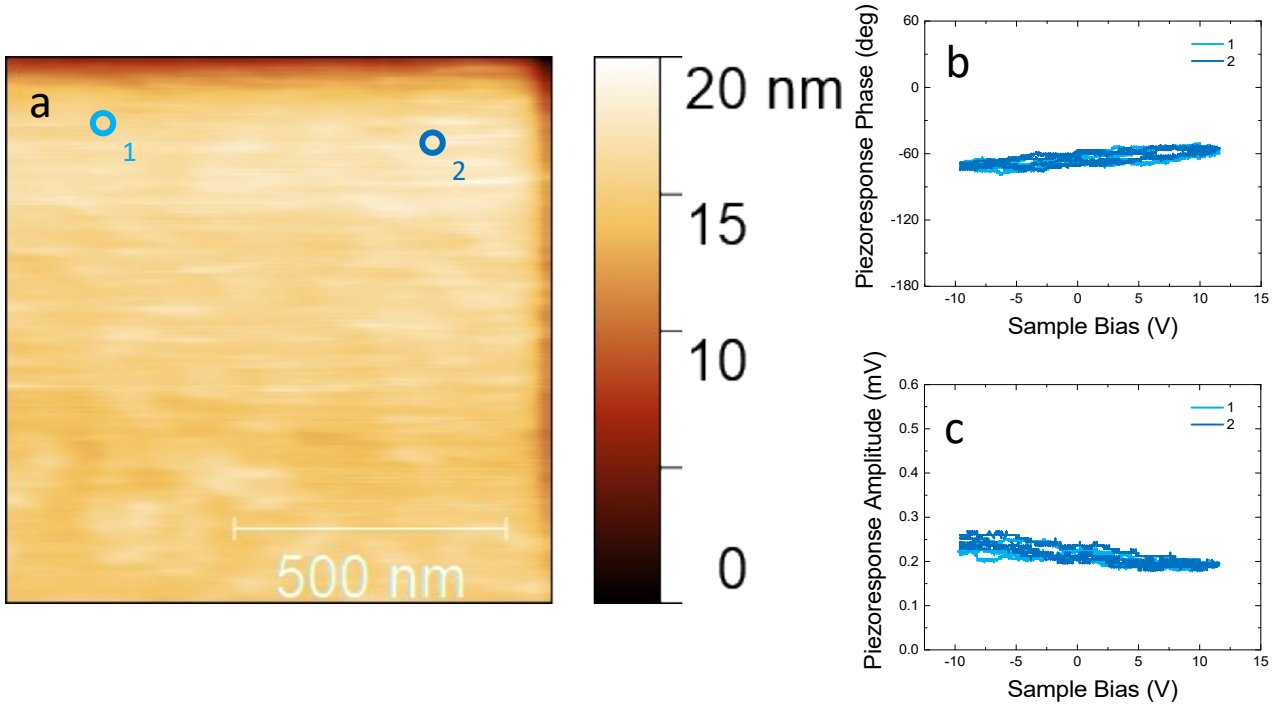

Figure S7 a) AFM topographical map of glass microscope slide (non-ferroelectric control sample); b) piezoresponse amplitude and c) piezoresponse phase hysteresis from regions 1 and 2 shown in a).