Supporting Information

for

Giant flexoelectricity of additively manufactured polylactic acid

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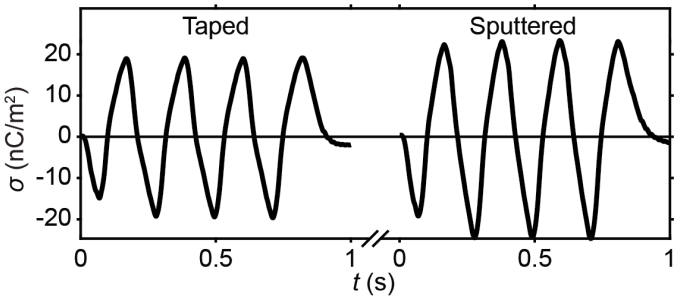

Figure S1. Surface charge density σ vs. time t for one sample with taped copper electrodes and another with sputtered copper electrodes. In both cases, the sample is 12 layers with a linear cross-hatched infill in which the first layer was 45°. Sputtered metal films, consisting of an adhesion layer of 10 nm of titanium and 1.5 mm of copper, were deposited consecutively in a Denton Discovery system without breaking vacuum in the sputtering chamber, to prevent formation of a native oxide layer on the titanium adhesion layer.

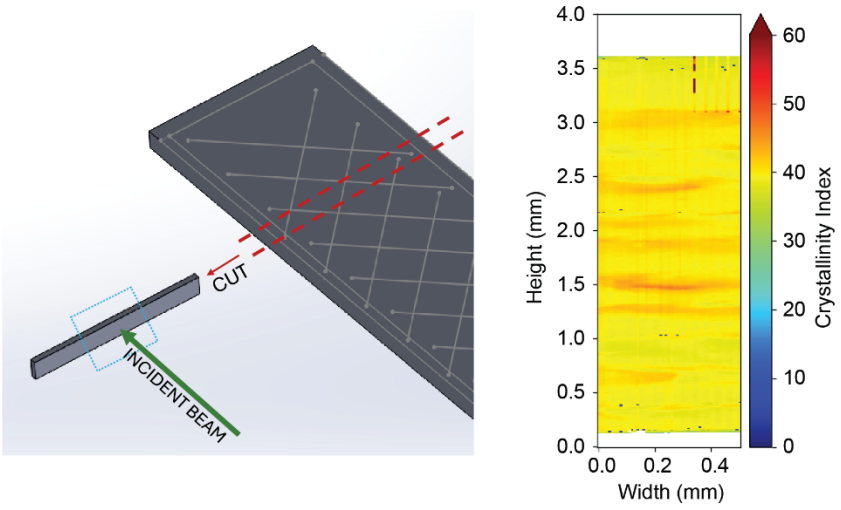

Figure S2. XRD to determine overall crystallinity and heterogeneities. Geometry of X-ray direction with respect to sample geometry. A cross section was scanned using microprobe XRD. Crystallinity map using microprobe scanning XRD through a cross section of an annealed 12-layer sample. Crystallinity index was determined according to prior work, and the average crystallinity index of the annealed samples was found to be 42%.[42]

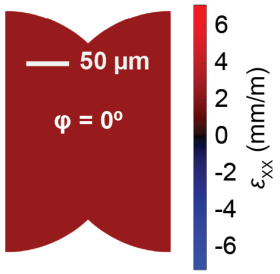

Figure S3. Finite element analysis of the geometry shown in Figure 3 but evaluating the longitudinal strain $\boldsymbol{\varepsilon_{xx}}$ in a section of one printed layer with a 0° infill angle under pure tension.

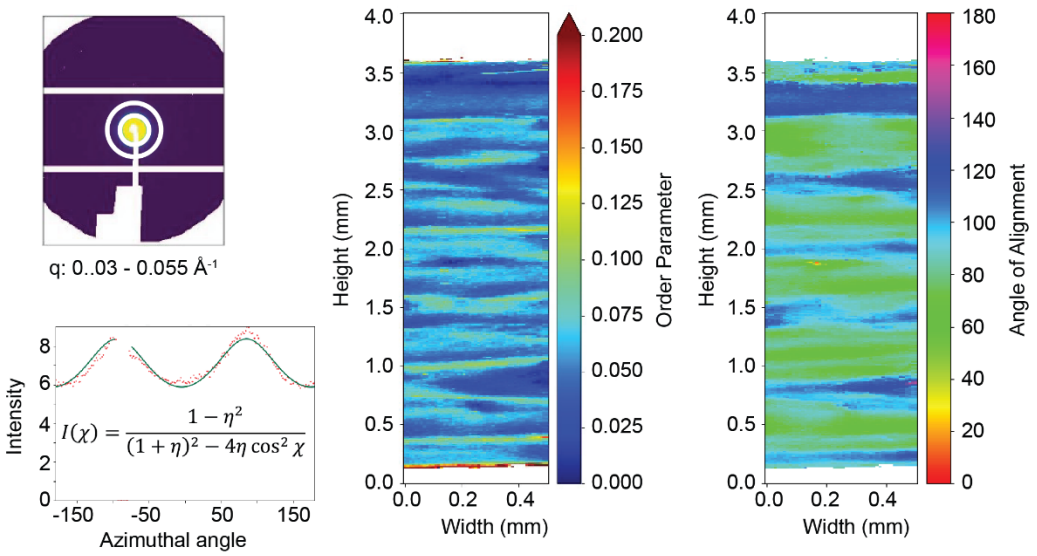

Figure S4. XRD to determine overall alignment and heterogeneities. 2D small angle X-ray pattern with marginal anisotropy. Azimuthal intensity distribution within q range of q = 0.03 – 0.055 Å^{-1}. Ruland method was used to calculate an order parameter for the anisotropy.[37] 2D map of order parameter for 12-layer sample. 2D map of orientation angle of scattering domains.

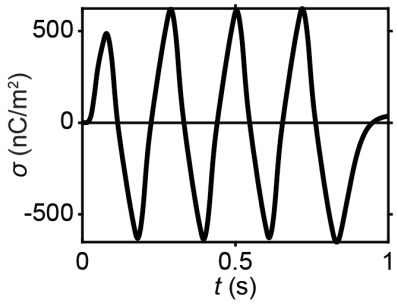

Figure S5. σ vs. t for samples using the FFF manufacturing parameters found to be most favorable for flexoelectric properties in these samples.