Supplementary Materials: Improved Electrical Signal of Non-Poled 3D Printed Zinc Oxide-Polyvinylidene Fluoride Nanocomposites

Sharmad Joshi [1], Enrique Gazmin [2], Jayden Glover [2], Nathan Weeks [2], Fazeel Khan [1], Scott Iacono [2] and Giancarlo Corti [1,*]

Supporting Information

Table S1. ZnO concentration measurements by weight

Sample	ave	stdev	error
PVDF	0	0	0.
2.5ZnO	3.093	0.113	0.06
5ZnO	4.683	0.213	0.12
7.5ZnO	6.853	0.277	0.16
10ZnO	9.193	1.137	0.65
12.5ZnO	11.856	0.8452	0.48
15ZnO	14.666	0.786	0.45
20ZnO	20.103	0.436	0.25

avg=average, stdev=standard deviation

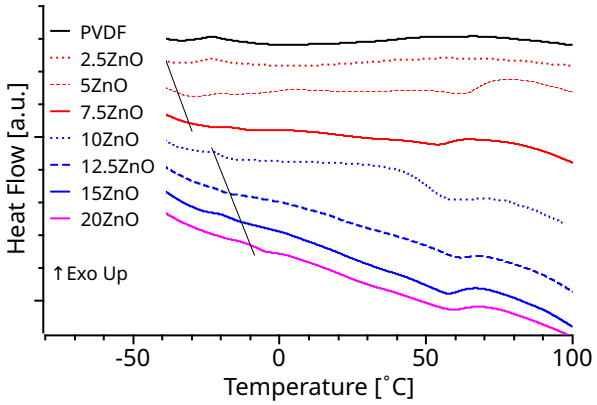

Figure S1. Glass transition temperature as function percentage of ZnO content.

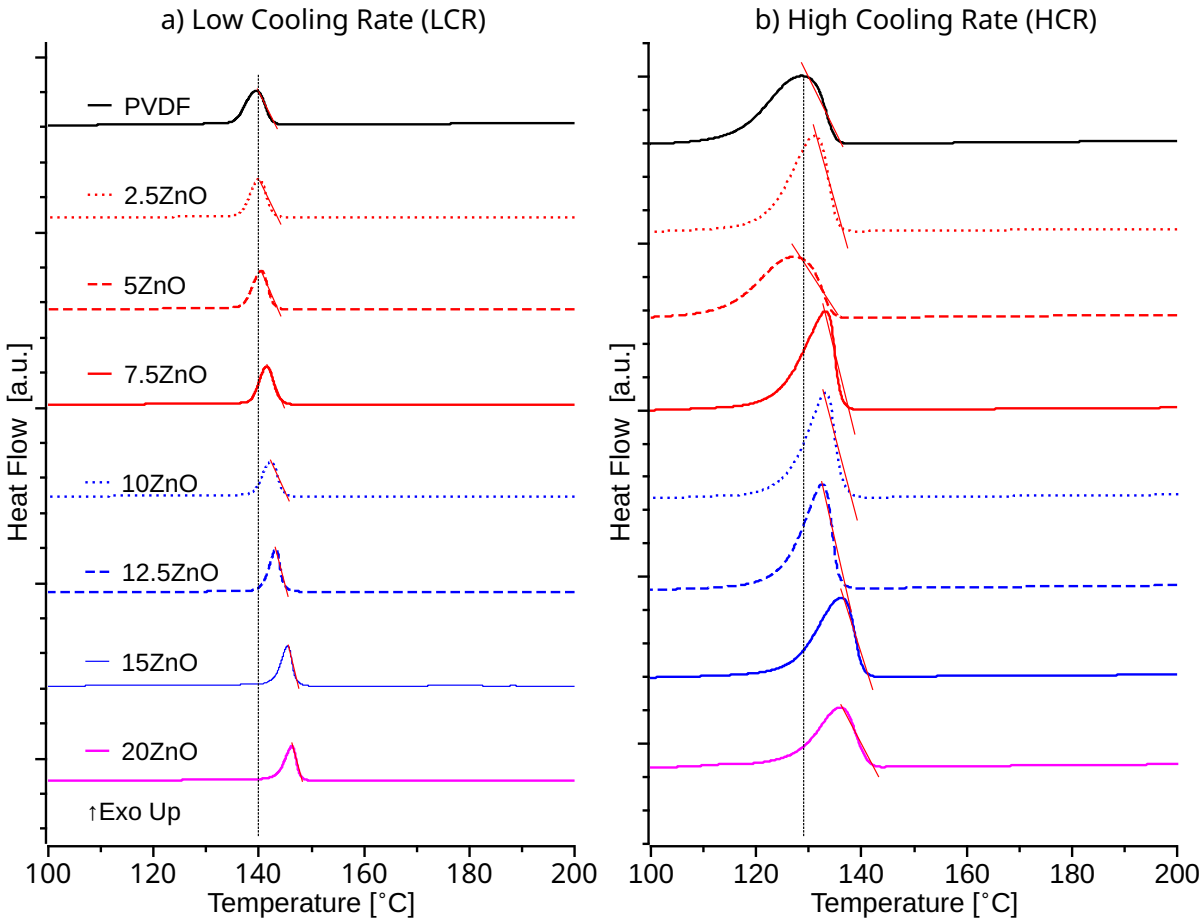

Figure S2. DSC crystallization for a cooling rate of a) 5°C min^{-1} LCR, and b) 30°C min^{-1} HCR.

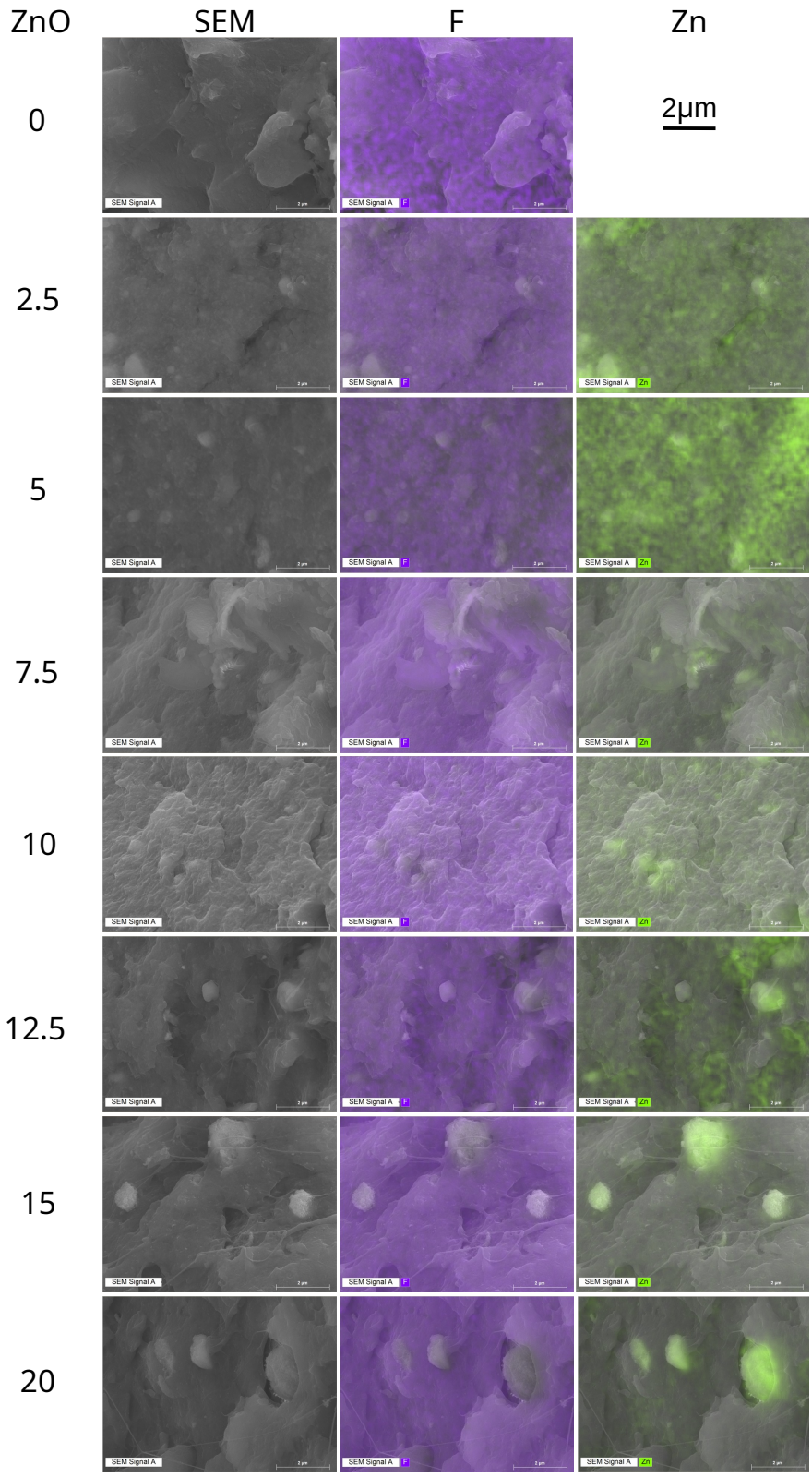

Figure S3. XEDS analysis at the failure of 3D printed specimens [45°,135°] tested under tensile stress.

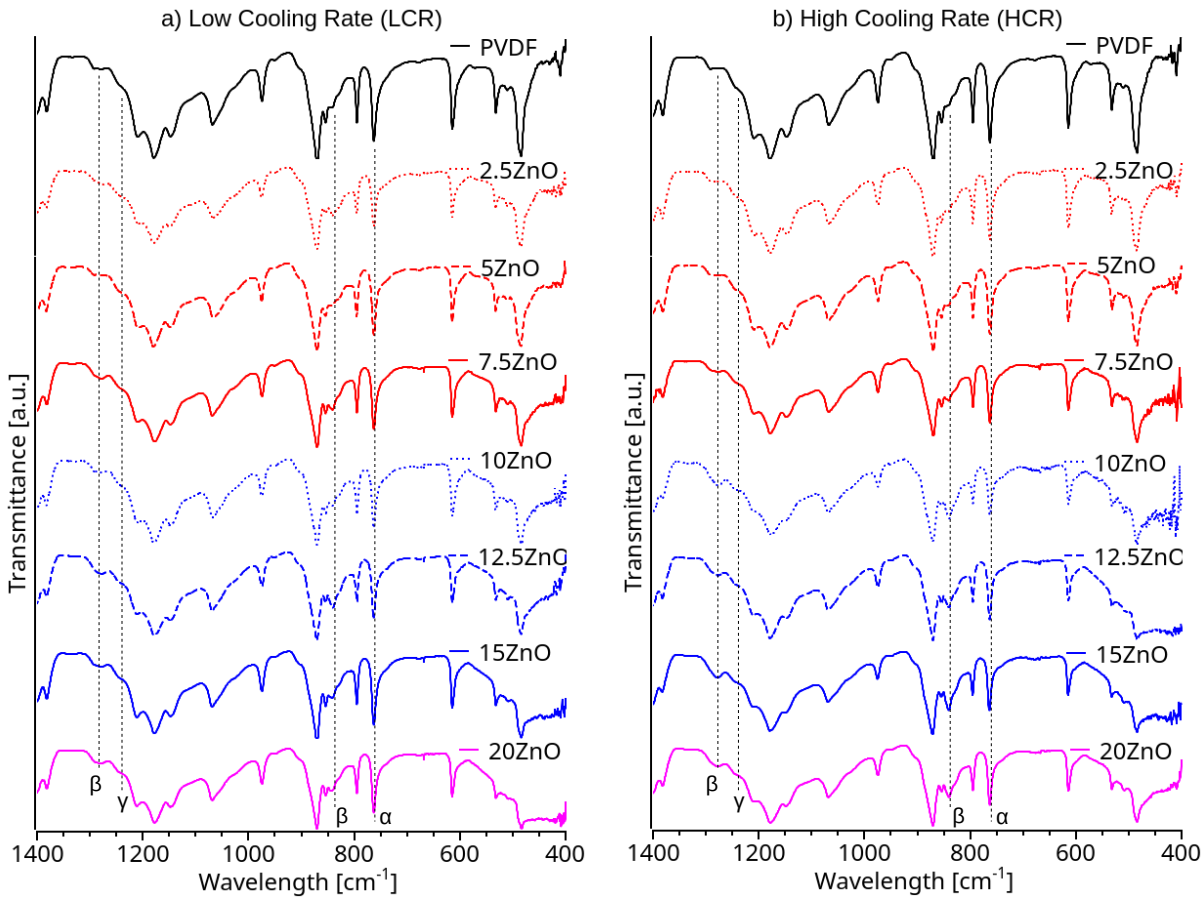

Figure S4. FTIR spectra of DSC samples after a cooling rate of: a) 5 °C min^{-1} LCR, and b) 30 °C min^{-1} HCR

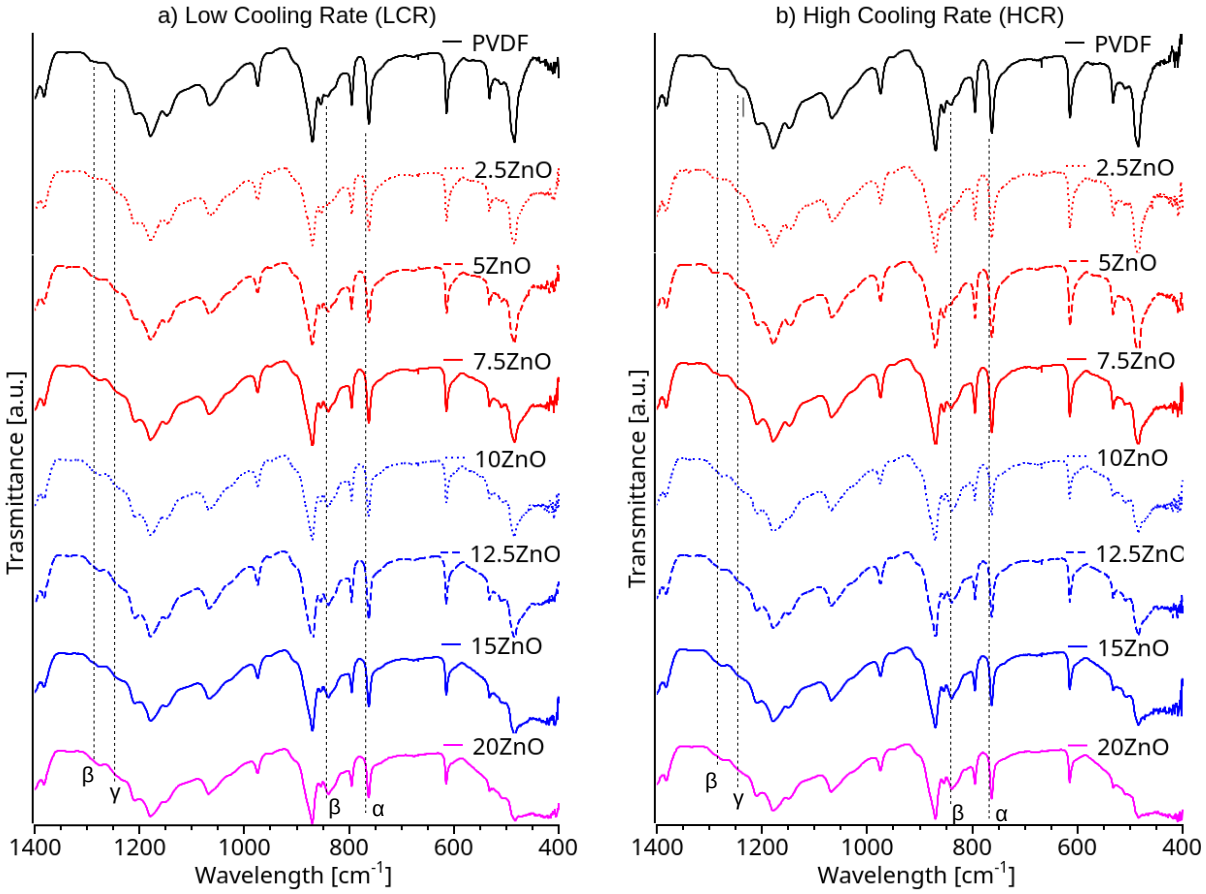

Figure S5. FTIR spectra from the top of a 3D printed DMA samples printed with a: a) 5 °C min^{-1} LCR, and b) 30 °C min^{-1} HCR.

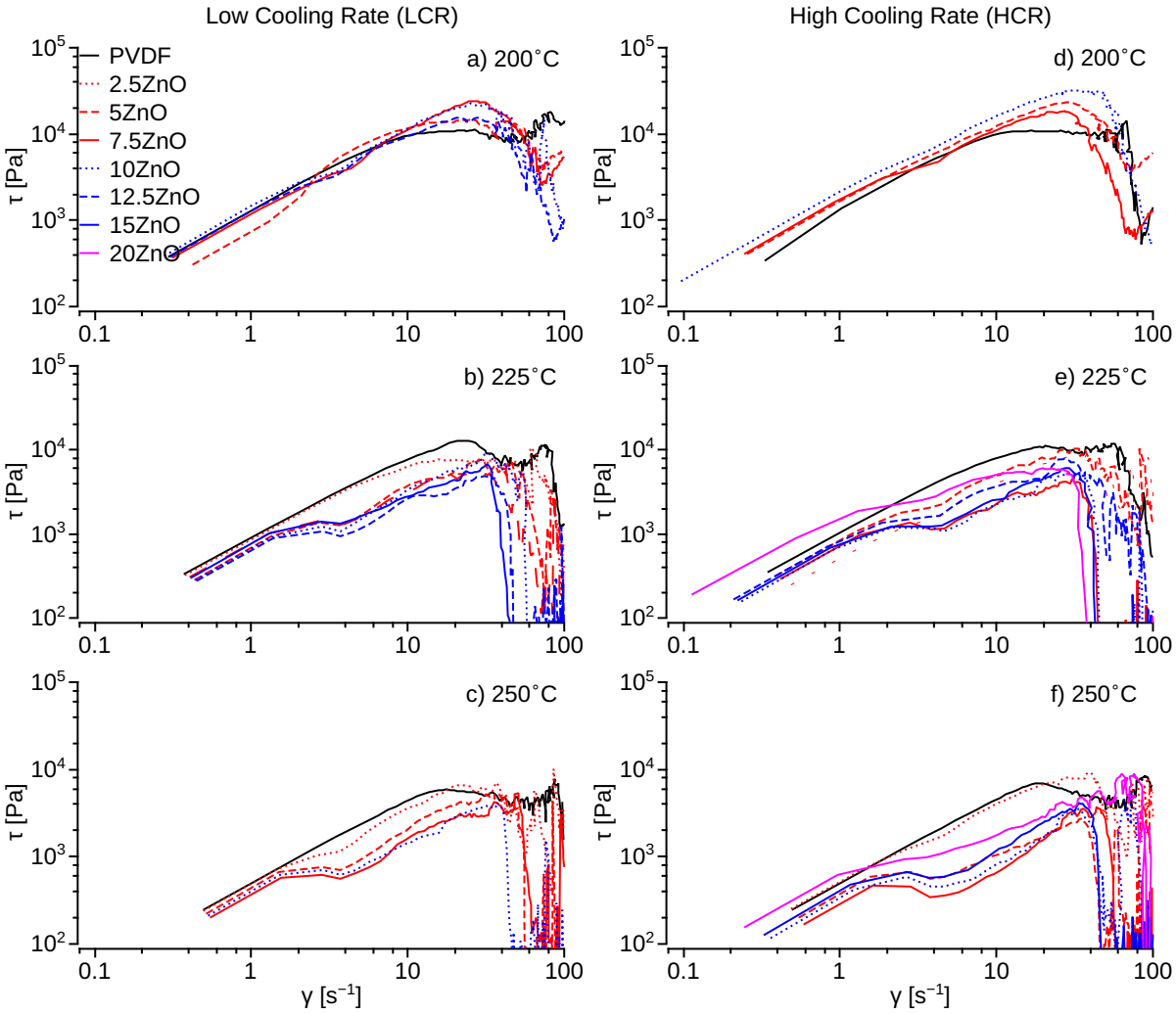

Figure S6. Shear stress τ versus shear rate γ at different temperature profiles for low and high cooling rate 3D printed samples.

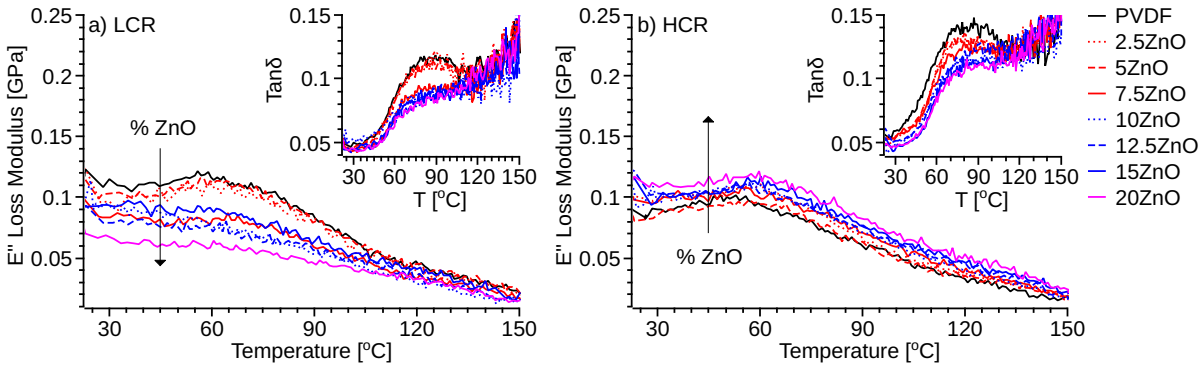

Figure S7. Loss modulus (E″) of DMA specimens 3D printed with: a) low cooling rate (LCR), and b) high cooling rate (HCR).

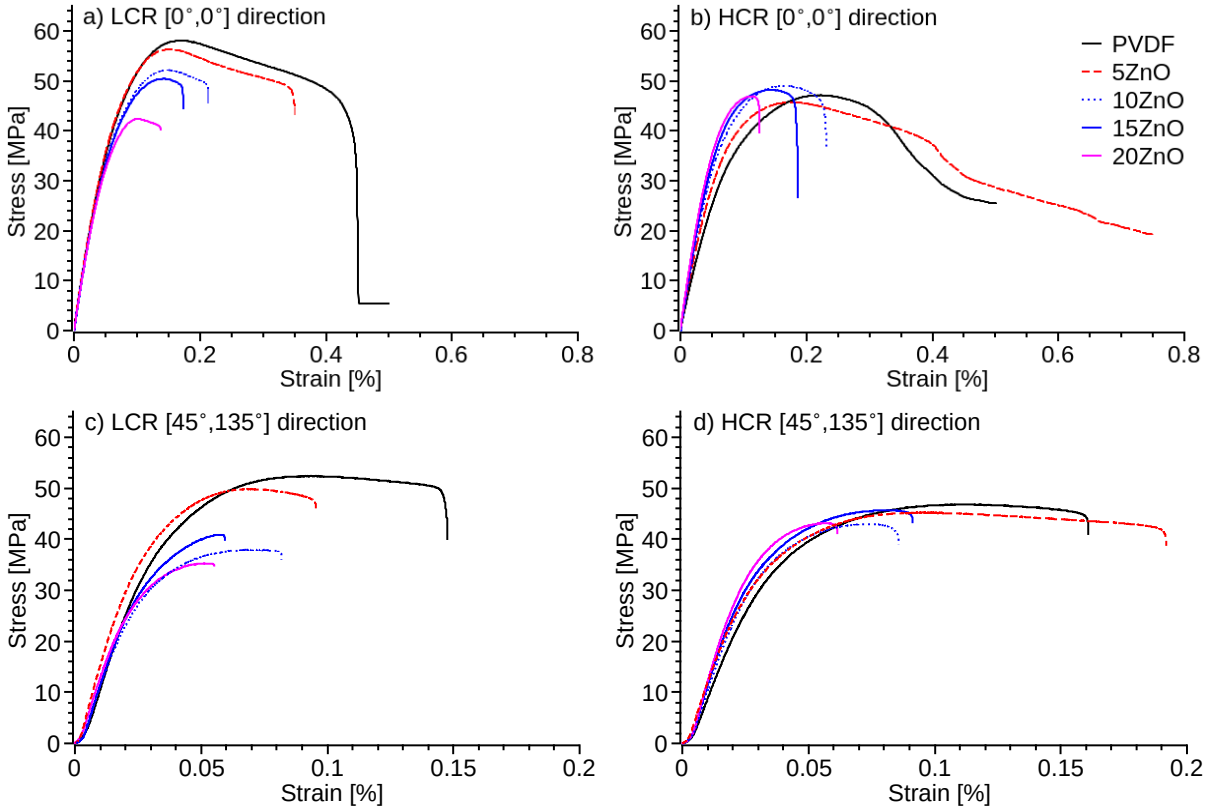

Figure S8. Sample stress vs. strain curves of tensile tests for 3D printed a) LCR with infill in the [0°,0°] direction, HCR with infill in the [0°,0°] direction, c) LCR with infill in the [45°,135°] direction, and HCR with infill in the [45°,135°] direction.

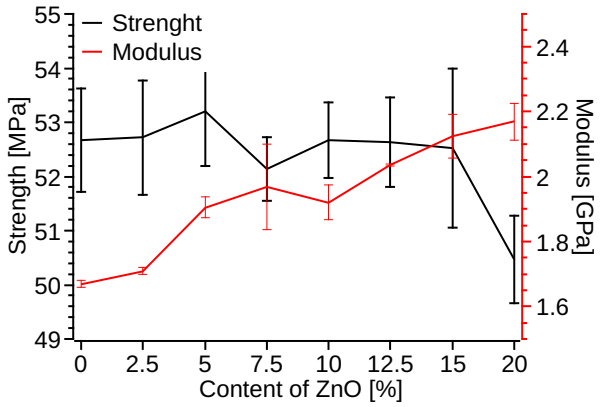

Figure S9. Strenght (black) and elastic modulus (red) of the extruded filaments.

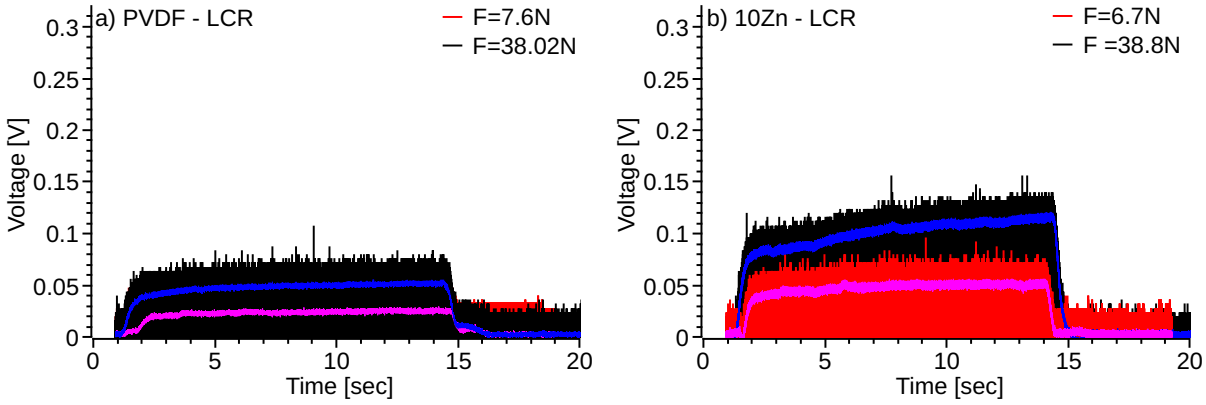

Figure S10. Voltage output in response to a 6Hz strain (ϵ) with an amplitude of 0.0058 mm·mm^{-1} (red) and 0.0274 mm·mm^{-1} (black) for LCR samples: a) pristine PVDF and b) PVDF with 10% ZnO. The blue and purple line represents a filtered voltage signal.

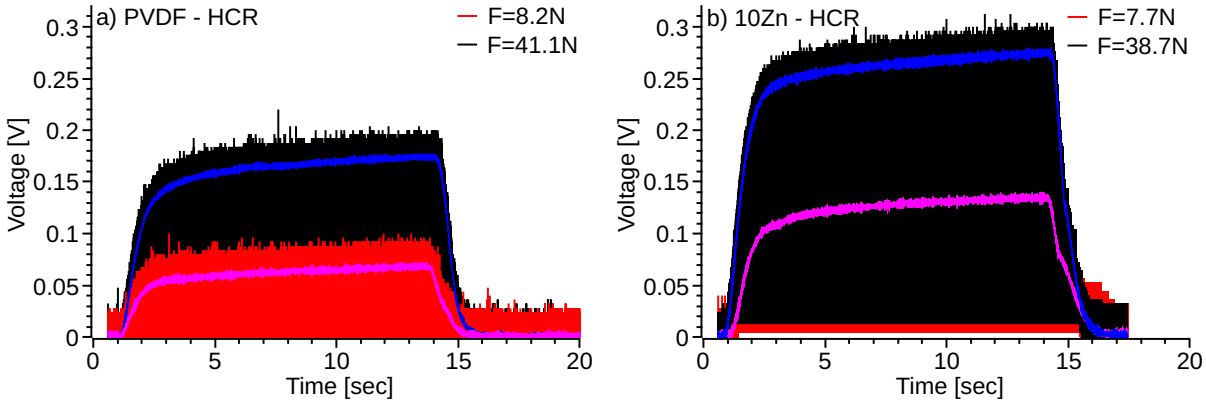

Figure S11. Voltage output in response to a 6Hz strain (ϵ) with an amplitude of 0.0058 mm·mm^{-1} (red) and 0.0274 mm·mm^{-1} (black) for HCR samples: a) pristine PVDF and b) PVDF with 10% ZnO. The blue and purple line represents a filtered voltage signal.

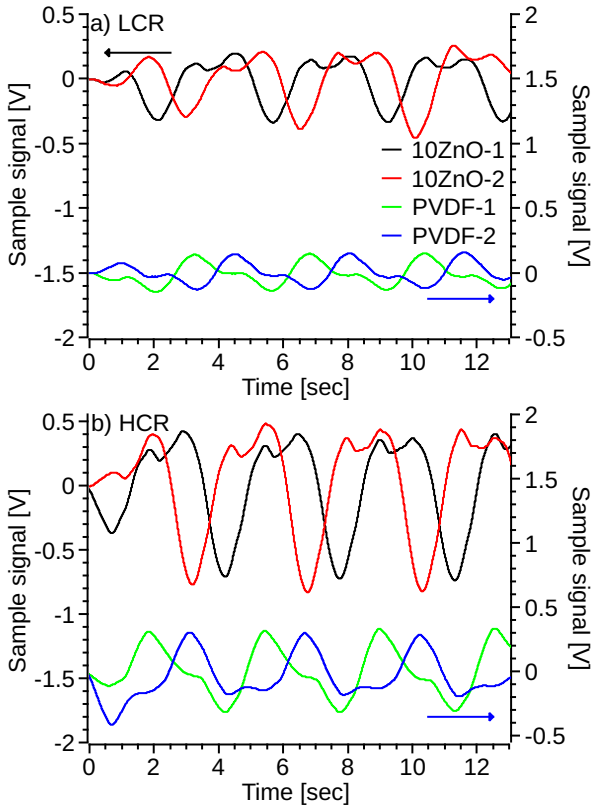

Figure S12. Voltage signal generated in response to a walking profile simulated on an MTS tensile frame by two diferent spcimens of pristine PVDF and 10%ZnO PVDF nanocomposite.