

Electronic Supporting Information

Resistive hysteresis in flexible nanocomposites and colloidal suspensions: Interfacial Coupling Mechanism unveiled

*Alessandro Chiolerio**, Ignazio Roppolo, Katarzyna Bejtka, Abil Asvarov, Candido Fabrizio Pirri

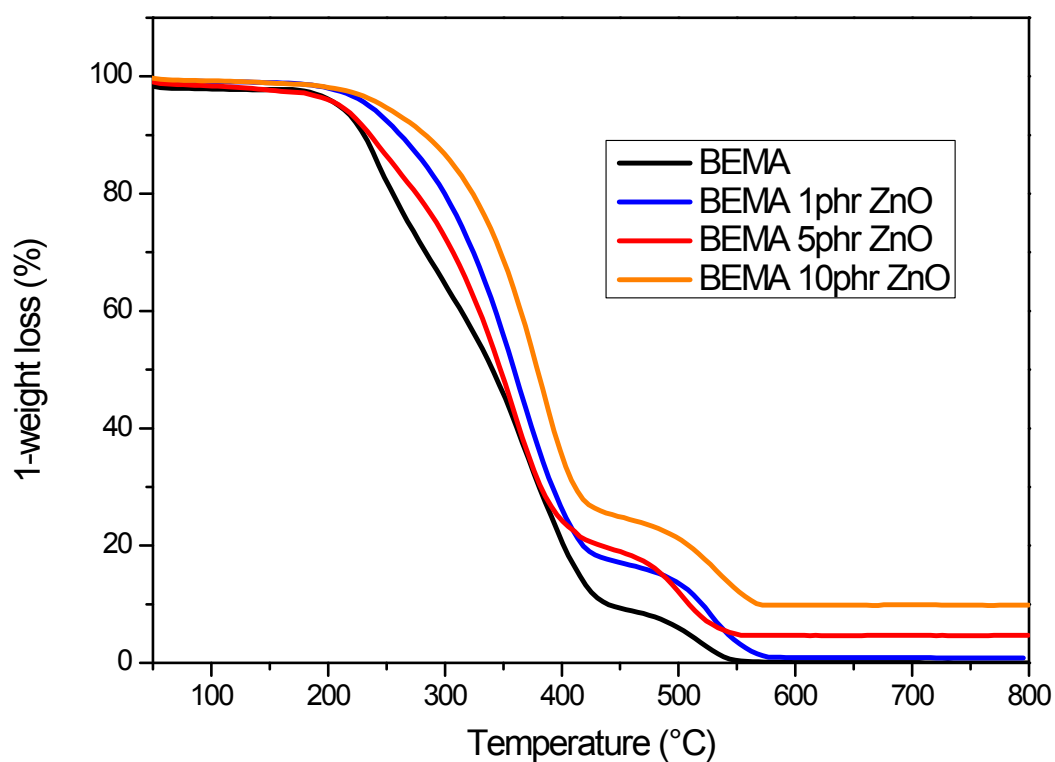


Figure S1 TGA data

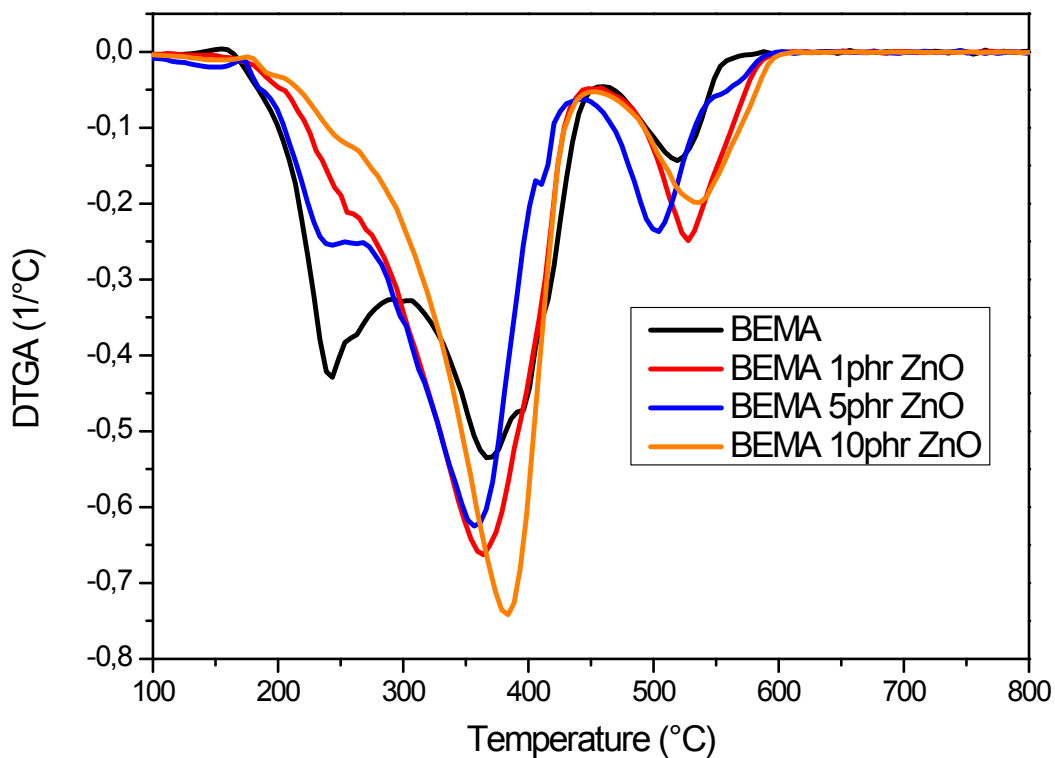


Figure S2 DTGA data

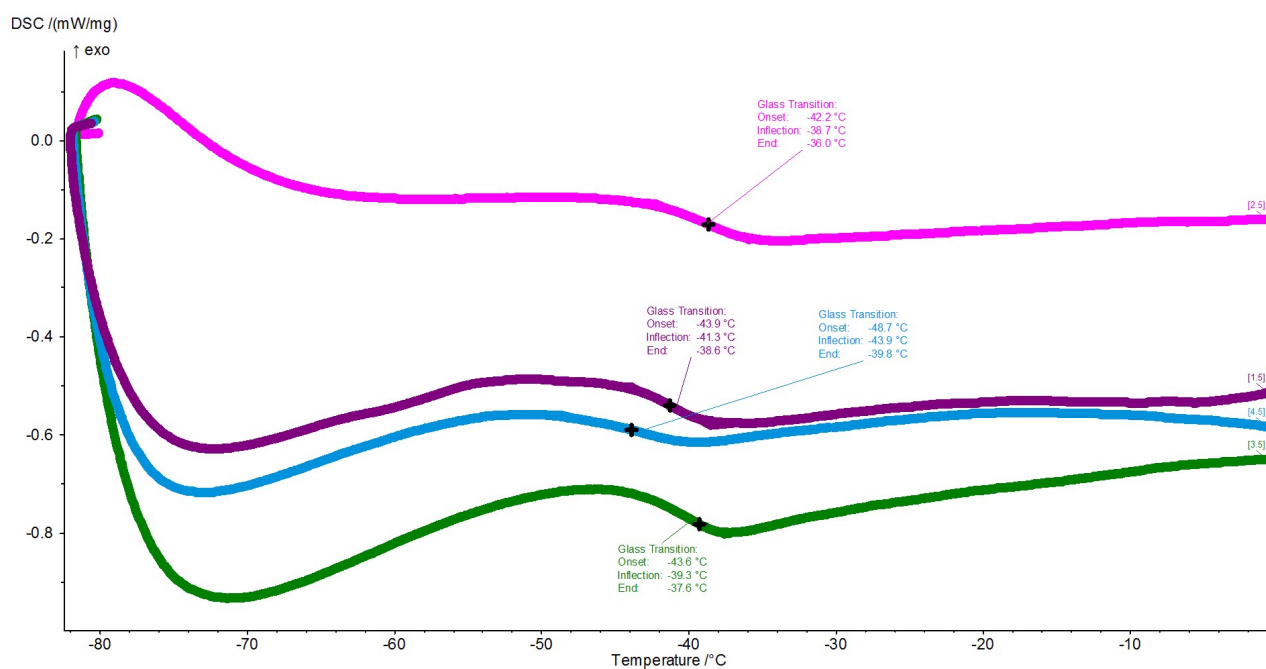


Figure S3 DSC curves of BEMA (purple), BEMA +1 phr ZnO (violet), BEMA +5 phr ZnO (green) and BEMA +10 phr ZnO (blue)

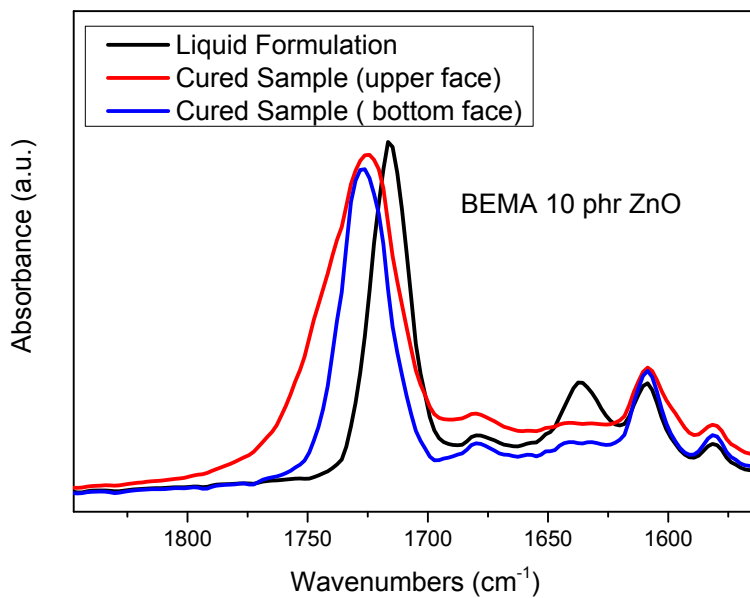


Figure S4 ATR measurement performed on the liquid formulation of BEMA 10 phr ZnO and on corresponding cured sample showing almost complete conversion of C=C double bond (1640 cm⁻¹ peak).

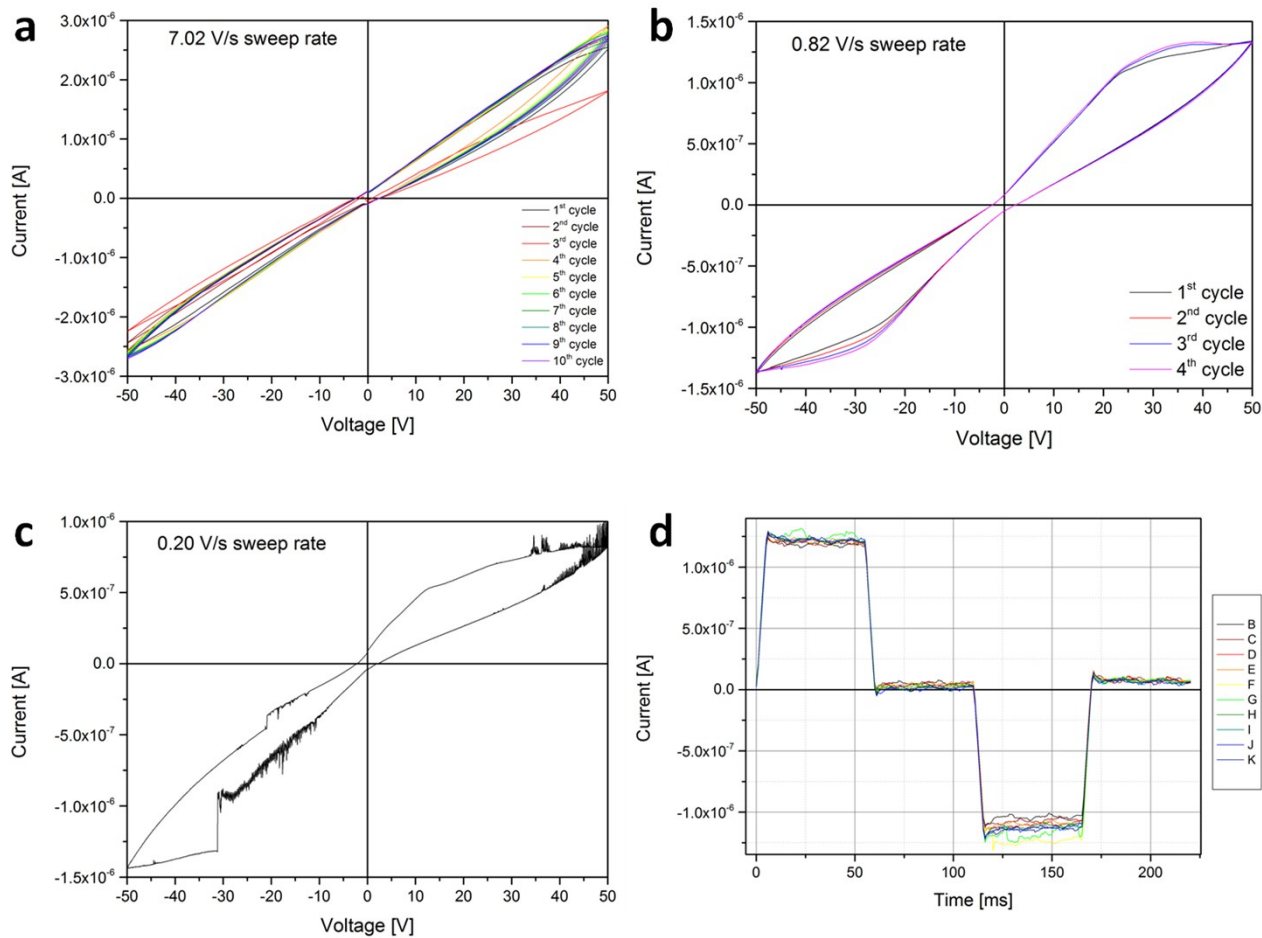


Figure S5 IV cyclic curves of the UV-cured pure BEMA matrix, at 7.02 V/s voltage sweep rate (a), 0.82 V/s (b) and 0.20 V/s (c). Pulsed cyclic measurements under trapezoidal waveform (d). Measurements taken in air at room temperature in CPE configuration, with Au / FTO asymmetric electrodes.

Table S1. Electrical properties of BEMA-ZnO NCs as per IV measurements taken with asymmetrical Cu electrodes.

Sample	Resistivity [$G\Omega$ cm]				R_{off}/R_{on} [%] @ $E=0$ V/cm		Energy loss [mW/cm^3]	Energy loss asymmetry [%]
	0/+100	+100/0	0/-100	-100/0	+	-		

BEMA	13.64±0.06	39.15±0.12	14.97±0.03	23.4±0.07	287	157	2.36	181
1phr ZnO	5.41±0.39	12.2±0.65	6.24± 0.57	12.9±0.03	225	207	5.26	61
5phr ZnO	2.56 ± 0.41	7.82 ± 0.19	5.41± 0.39	7.91±0.46	305	146	12.08	176
10phr ZnO	1.08±0.05	2.01±0.02	0.61±0.01	2.12±0.02	185	357	57.31	59

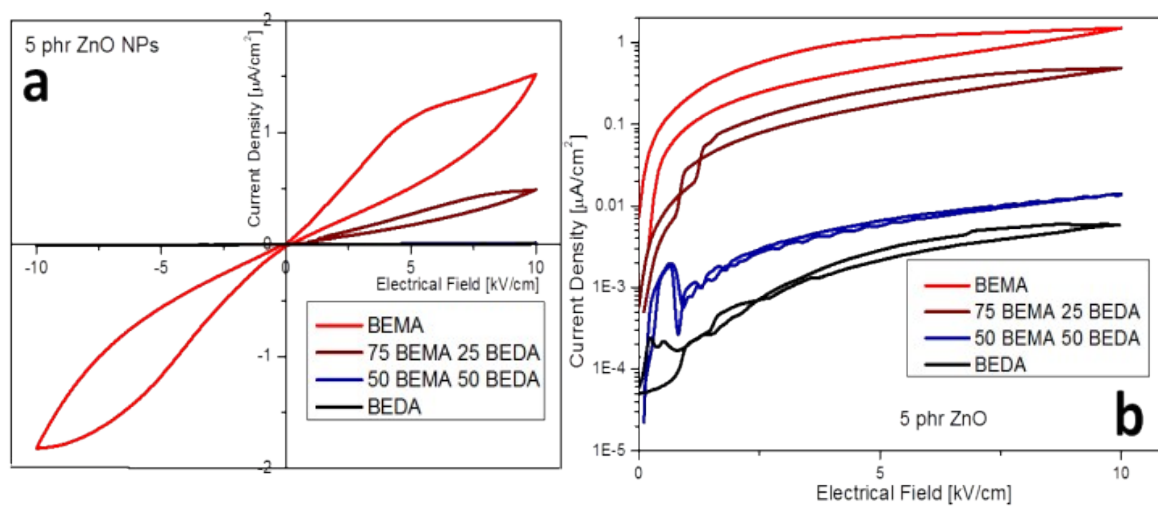


Figure S6. IV cyclic curves of the UV-cured blends between BEMA and BEDA containing 5 phr of ZnO (group 2) in both the linear (a) and logarithmic scale (b).

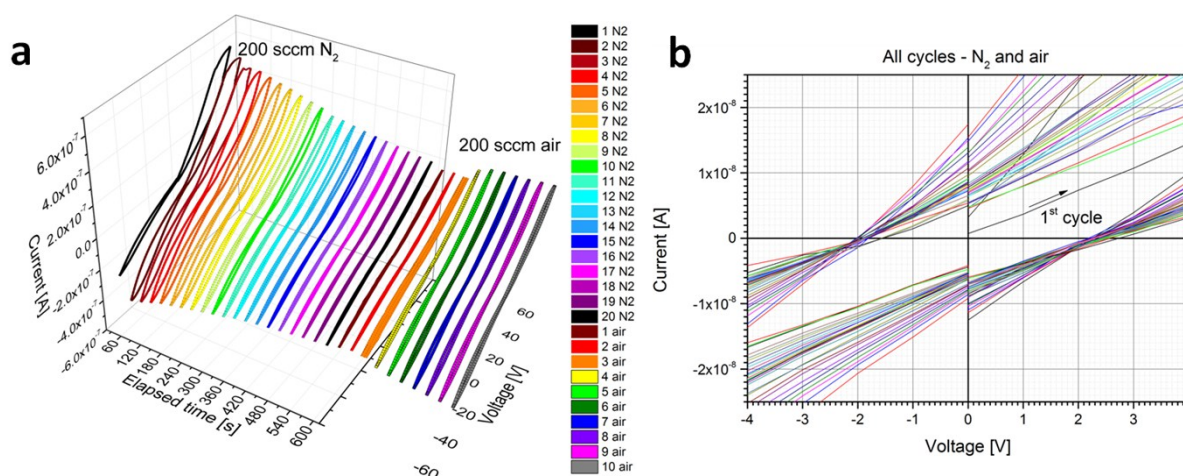


Figure S7. IV cyclic stacked curves of the UV-cured BEMA NCs with 10 phr of ZnO NPs (group 1), at 7.02 V/s voltage sweep rate under continuous 200 sccm nitrogen flow followed

by air flow (a), magnified superposition of cycles showing the “nanobattery” effect (b).

Measurements were taken at room temperature in CPE configuration, with Au / FTO asymmetric electrodes.

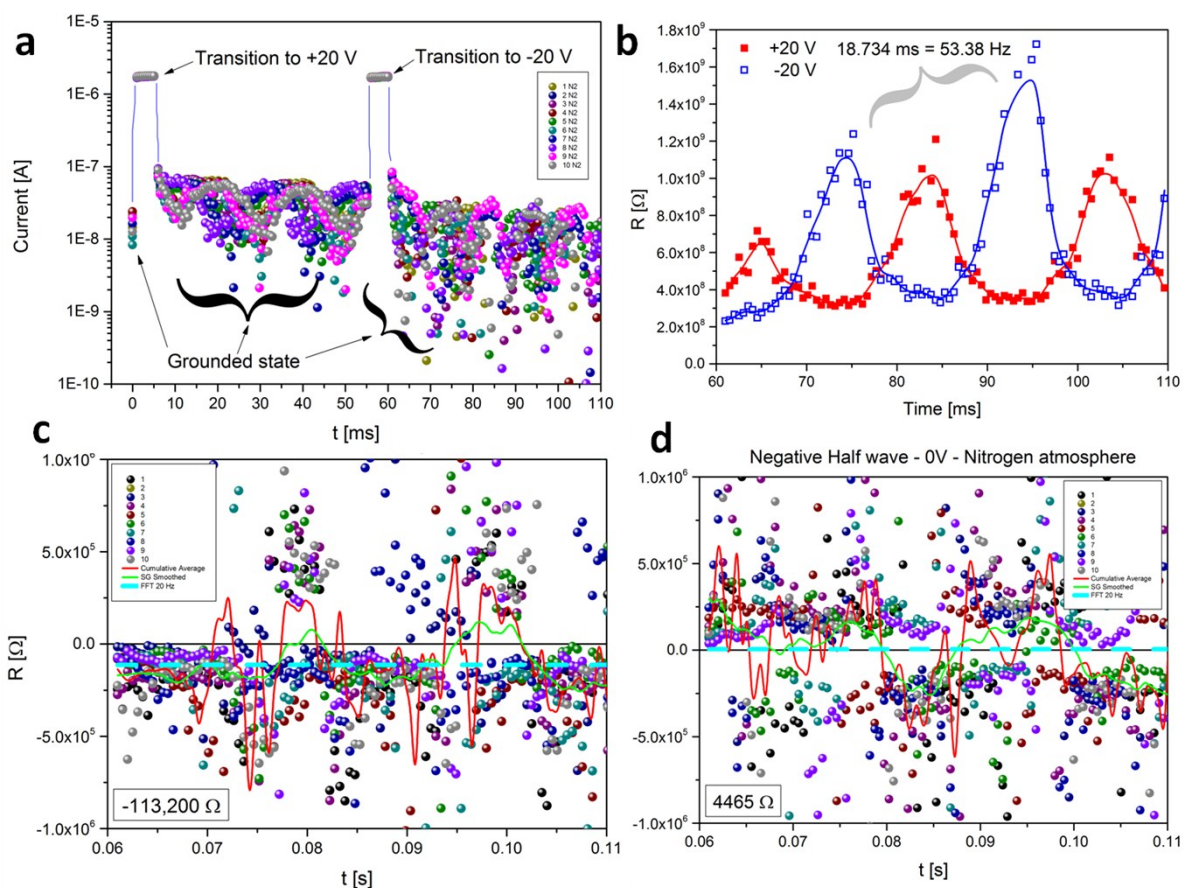


Figure S8. Pulsed waveform characterization of the UV-cured BEMA NCs with 10 phr of ZnO NPs (group 1). Complete graph showing response to pulses (a), magnified portion corresponding to a positive/negative pulse (b), portion corresponding to idle voltage after positive pulse (c), portion corresponding to idle voltage after negative pulse (d).

Measurements were taken under nitrogen at room temperature in CPE configuration, with Au / FTO asymmetric electrodes.

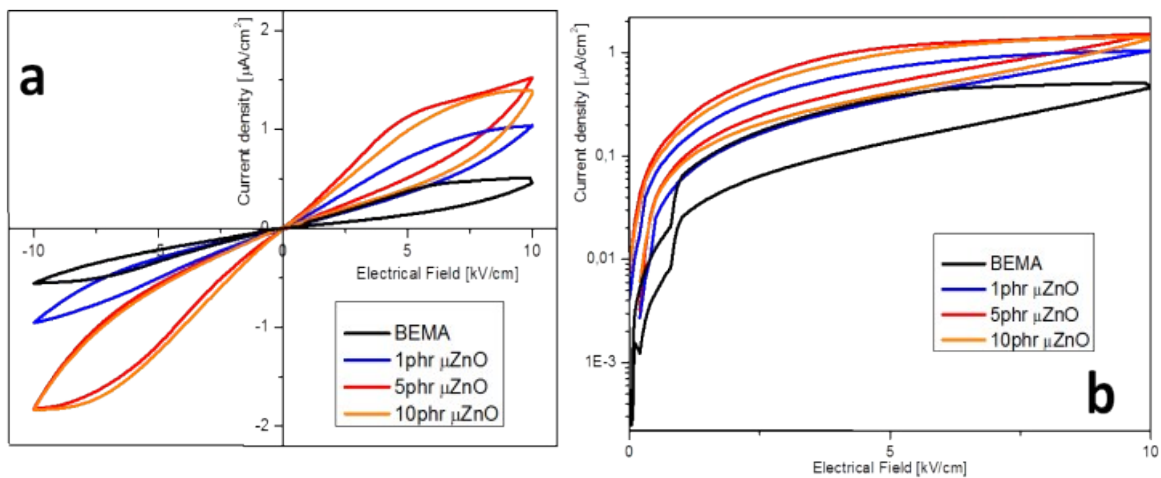


Figure S9. IV cyclic curves of the BEMA composites containing ZnO microparticles with 1, 5 and 10 phr (group 3) in both the linear (a) and logarithmic scale (b).

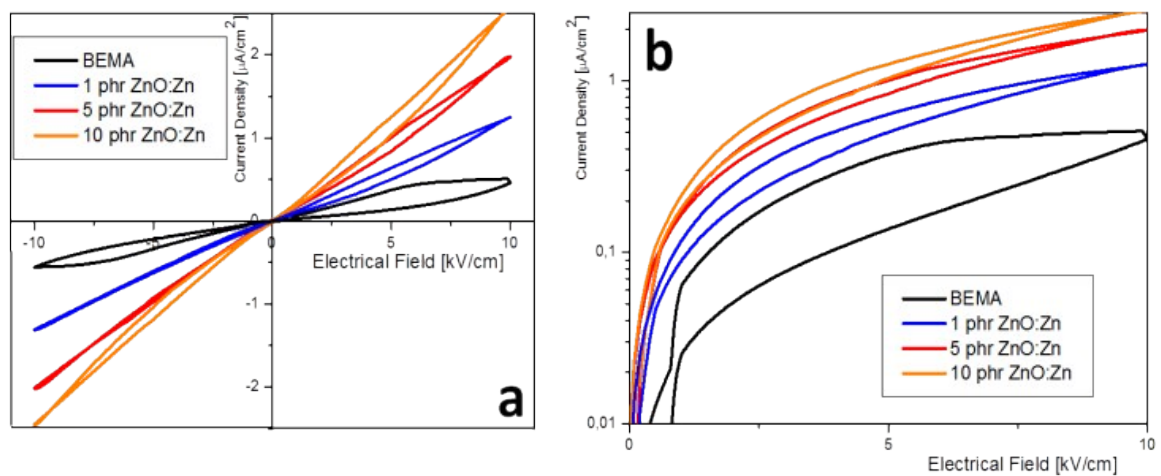


Figure S10. IV cyclic curves of the BEMA composites containing ZnO:Zn NPs with 1, 5 and 10 phr (group 4) in both the linear (a) and logarithmic scale (b).

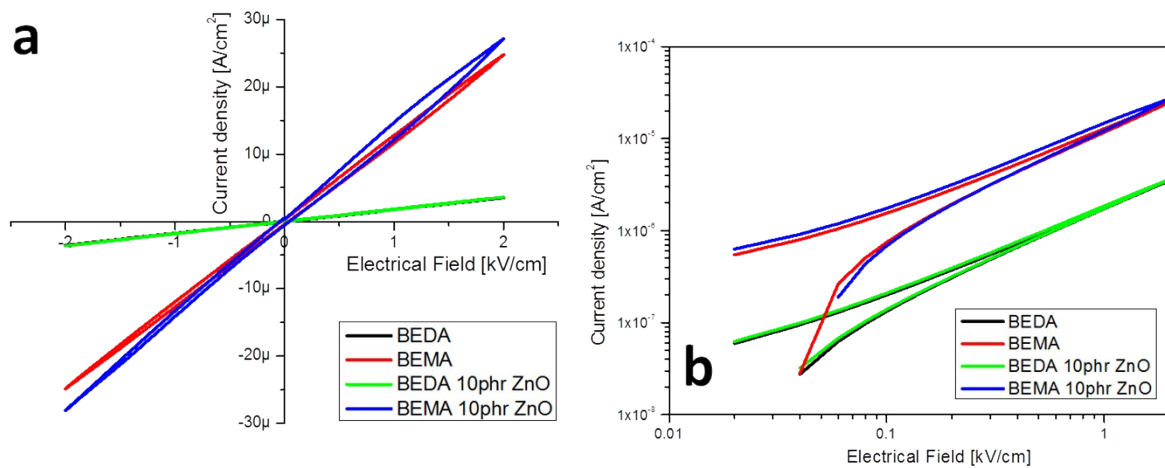


Figure S11 JE measurements taken in liquid formulations, shown in the linear (a) and logarithmic scale (b).

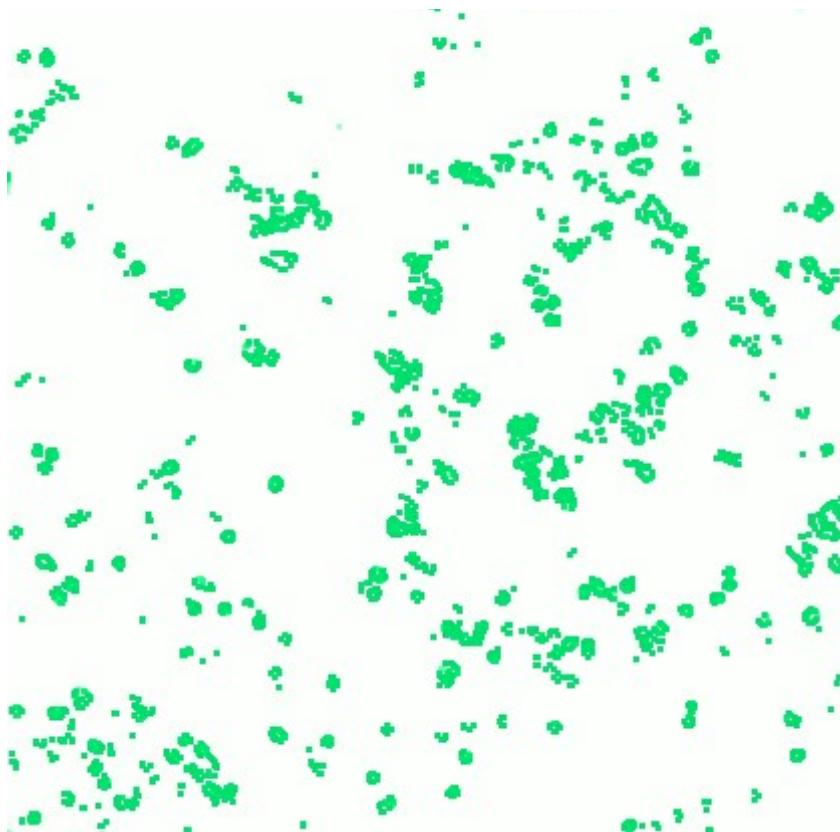


Figure S12 Panel 2c after edge enhancement through Laplace filter and artificial colouring, to enhance the distribution of ZnO NPs in the NC cross section.