Supporting Information

Piezoelectric nanogenerator induced work function on metal phenolic coordination framework from copper oxide nanosphere for efficient biomechanical energy harvesting and physiological monitoring

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Supporting Figures
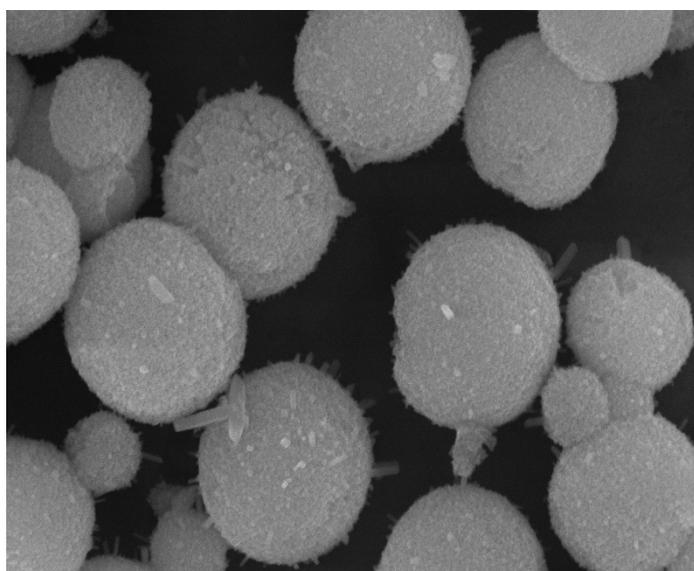
Figure S1. The SEM images of CuO nanospheres.
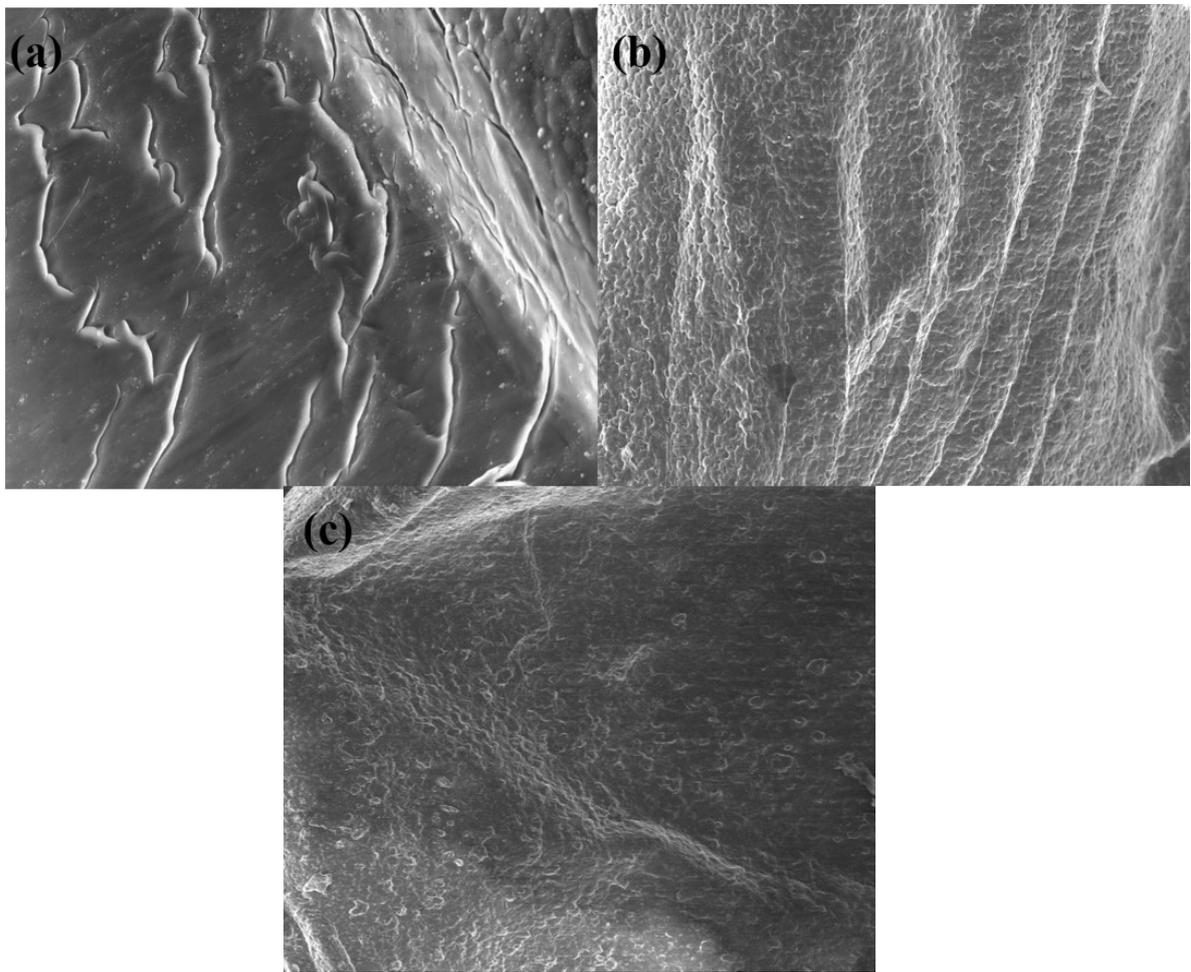
Figure S2 The SEM image of (a) PVDF, (b) CuO-TA-PVDF composite, (c) Cu-TA-PVDF composite.

(a)

(b)
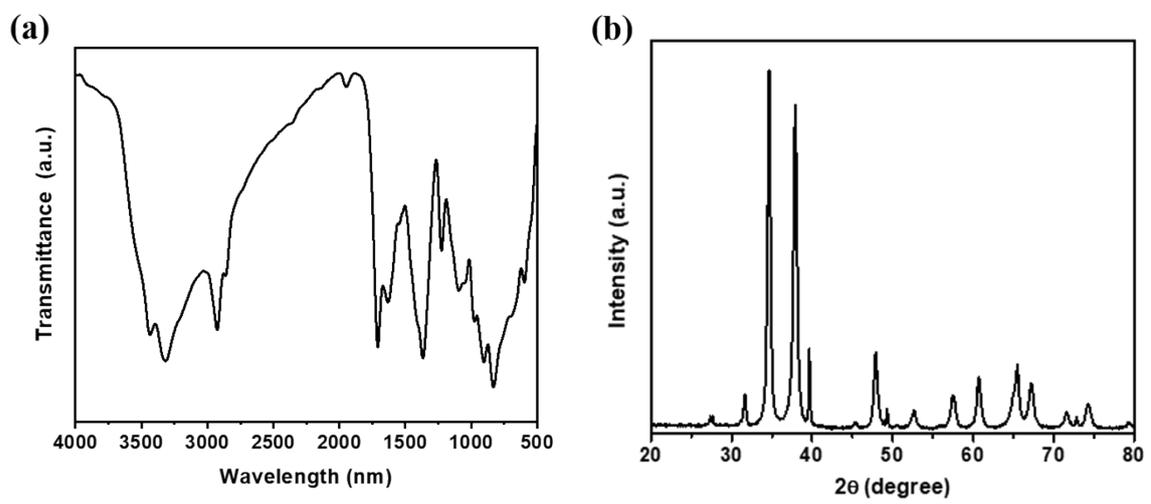
Figure S3 The FT-IR spectra (a) and XRD image (b) of CuO nanosphere.
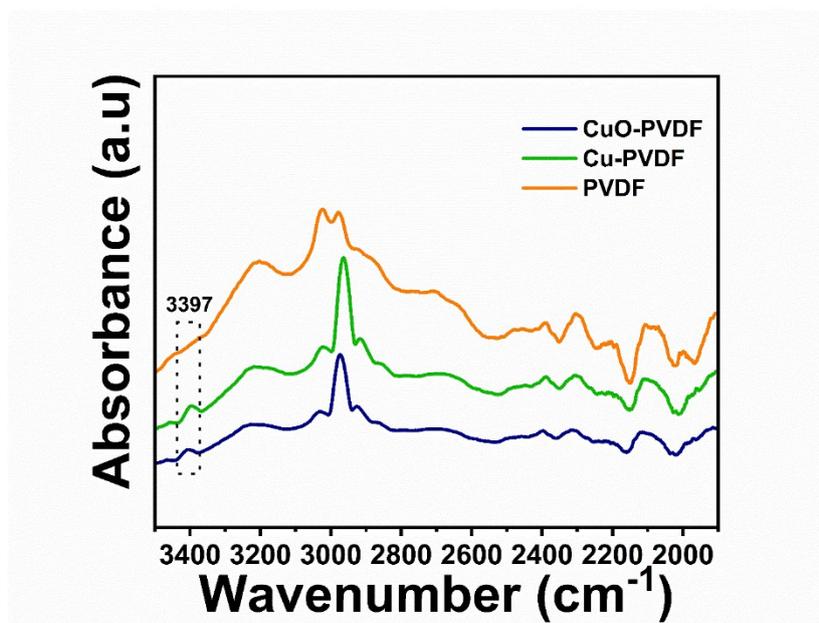
Figure S4 The FT-IR spectra of PVDF, Cu-TA-PVDF and CuO-TA-PVDF.
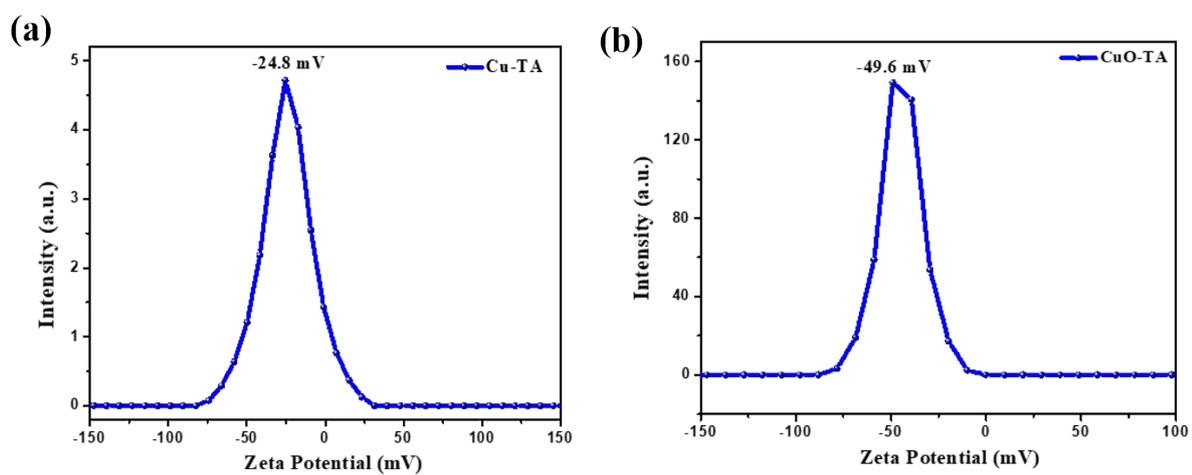
Figure S5 The Zeta-potential of (a) Cu-TA nanocubes and (b) CuO-TA nanosheets.

(a)

CuO-TA

Surface area= 340.831 m^2/g
Pore volume= 0.155 cc/g

Desorption

Adsoption

Adsorbed Volume (cm^3/g)

Relative Pressure (P/P_0)

(b)

Cu-TA

Surface area= 165.066 m^2/g
Pore volume= 0.039 cc/g

Desorption

Adsorption

Adsorbed Volume (cm^3/g)

Relative Pressure (P/P_0)
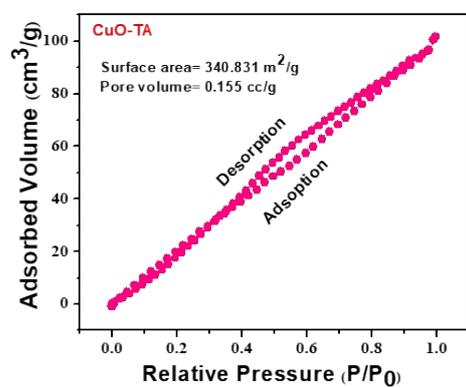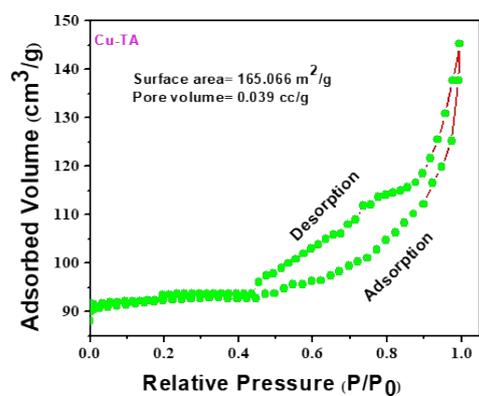
Figure S6 N_2 adsorption-desorption isotherm of (a) CuO-TA nanosheet and (b) Cu-TA nanocubes.
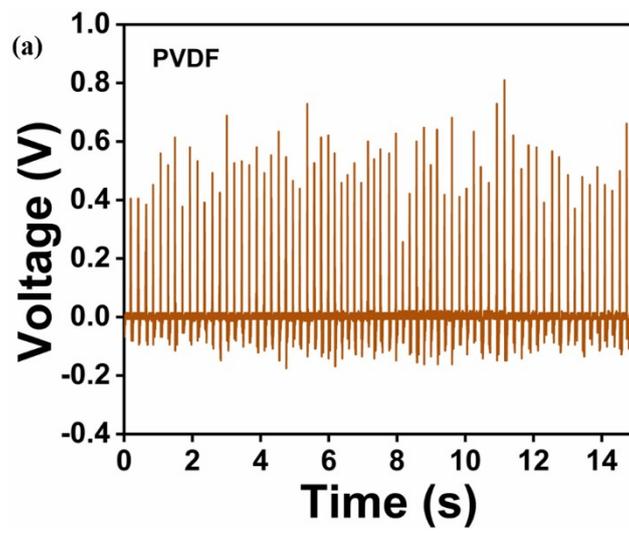
Figure S7 Output voltage recorded for bare PVDF based PNG.
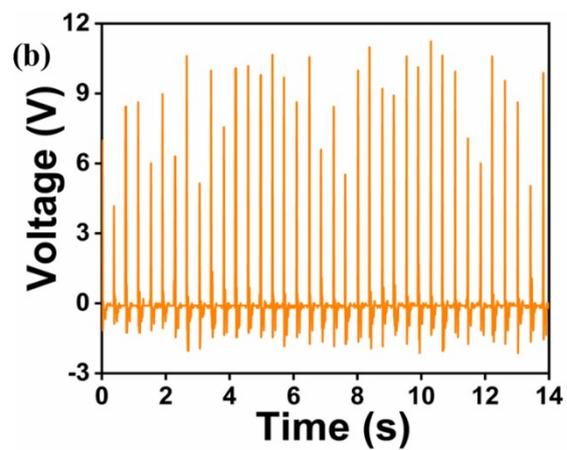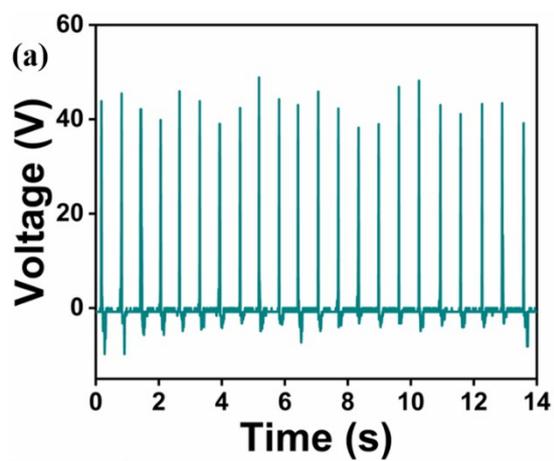
Figure S8 Output voltage responses of (a) CuO-TA PNG without PP tape, (b) Cu-TA PNG without PP tape.
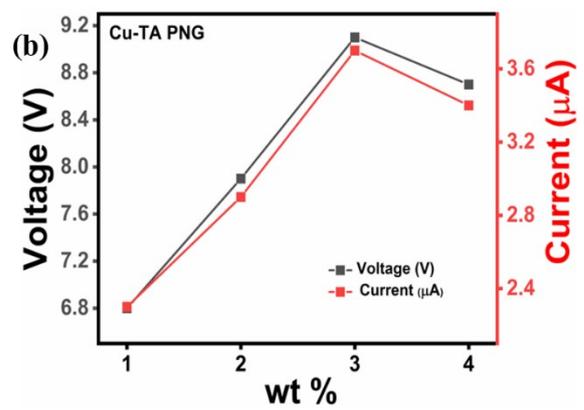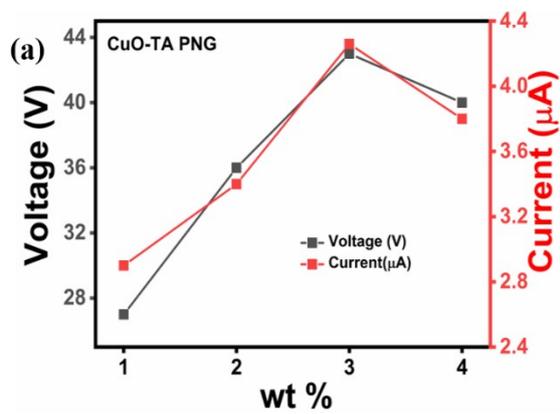
Figure S9 Weight percentage dependents on current and voltage outputs in (a) CuO-TA PNG, (b) Cu-TA PNG.
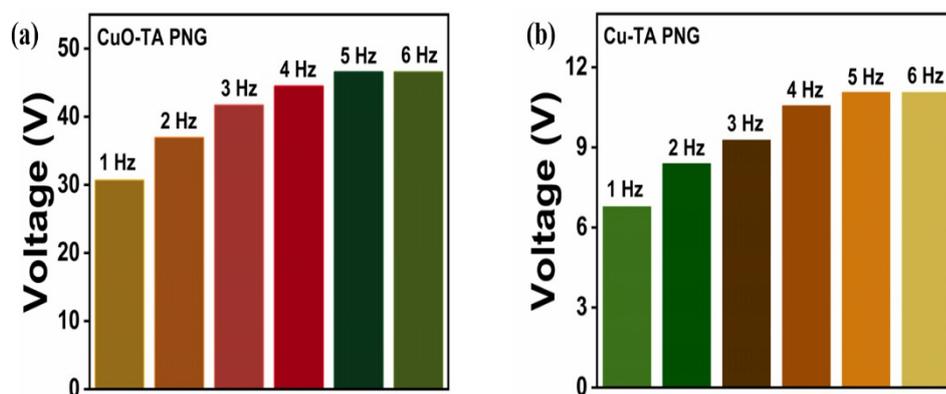
Figure S10. Frequency dependent voltage variation of (a) CuO-TA PNG, (b) Cu-TA PNG
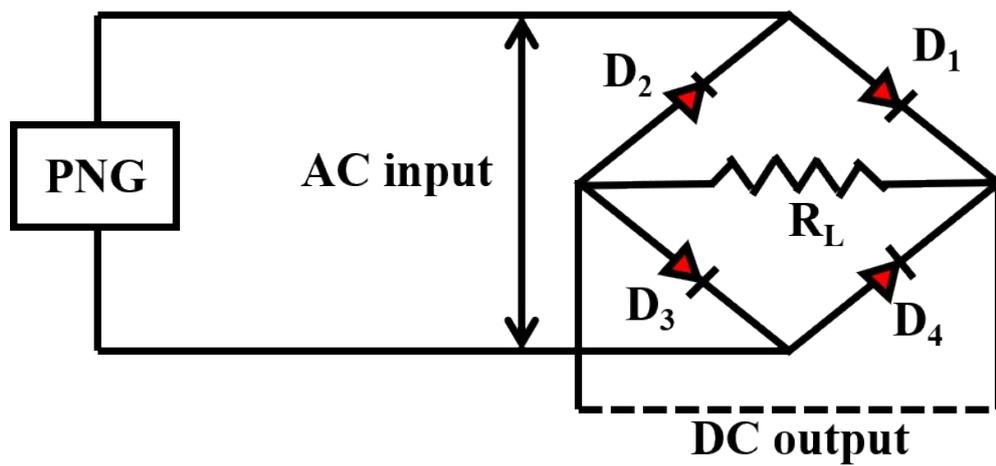
Figure S11: Circuit diagram for rectification of the output signal of the PNG.

The relative beta phase proportion in Cu-TA/PVDF and CuO-TA/PVDF nanocomposites were calculated from the FTIR spectra using the formula:

$$F_\beta = \frac{A_\beta}{\left(\frac{K_\beta}{K_\alpha}\right)A_\alpha + A_\beta}$$

Wherein, A_α and A_β denote the absorbance values of alpha and beta phases respectively. K_α and K_β represents the absorption coefficients with the value of 6.1×10^4 and 7.7×10^4 cm^{-1}/mol.

Using the above formula, F_β values for Cu-TA/PVDF and CuO-TA/PVDF nanocomposites were calculated to be 80.89% and 89.18% respectively.

Supporting videos

Video S1: Charging of 3.3 µF capacitor by finger tapping.

Video S2: Powering a buzzer using CuO-TA PNG.

Video S3: Lighting up six yellow LEDs in series using CuO-TA PNG.