Supporting Information

Self-poled hBN-PVDF nanofiber mat based low cost, ultra-high performance piezoelectric nanogenerator for biomechanical energy harvesting

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1. Characterisation of hBN:

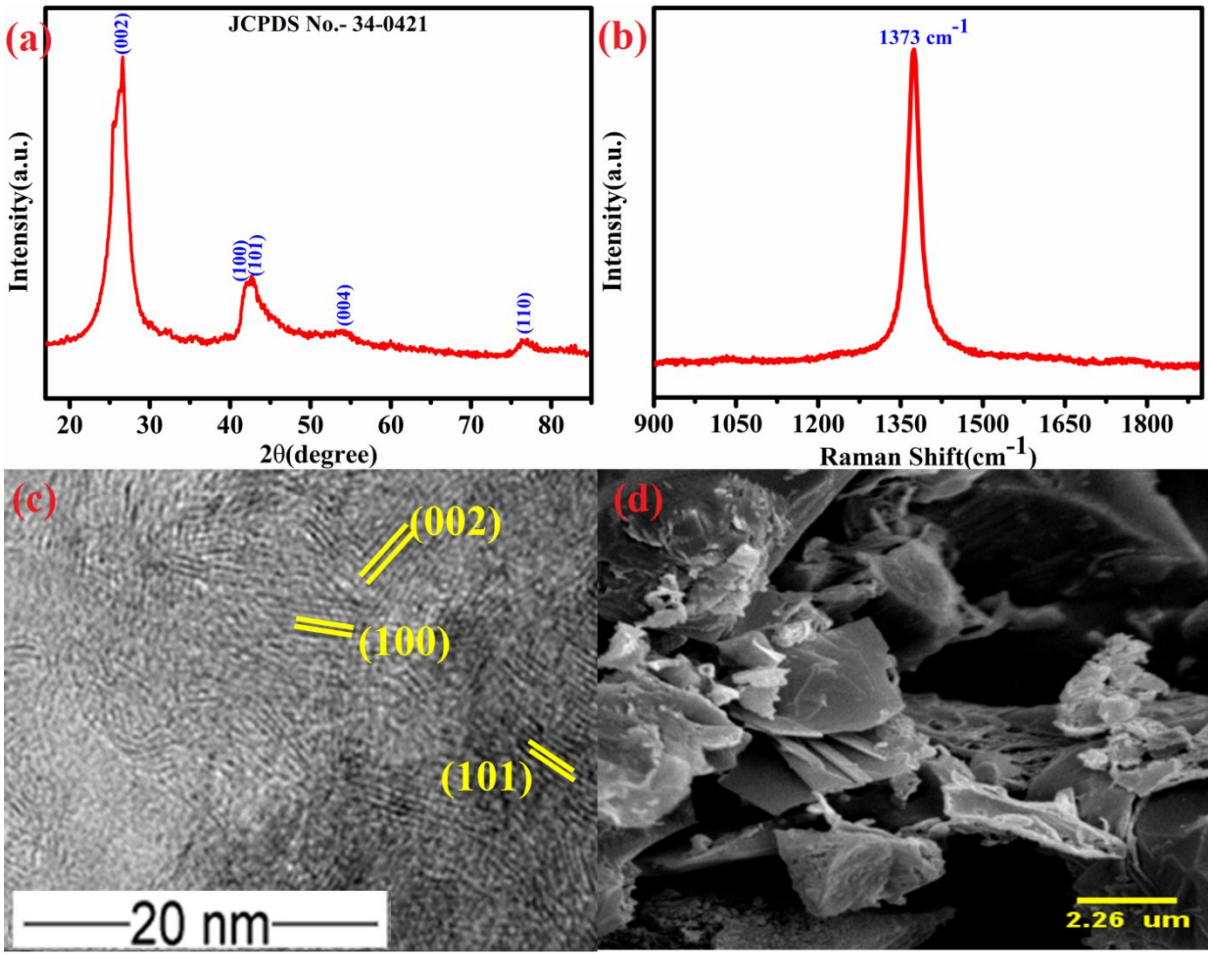

Fig. S1 (a) XRD and (b) Raman graphs of hBN nanoflakes, (c) TEM (showing the lattice fringes) and (d) SEM images of hBN nanoflakes.

2. Area-wise performance of the BNNF-PVDF nanofiber mat-based PENG:

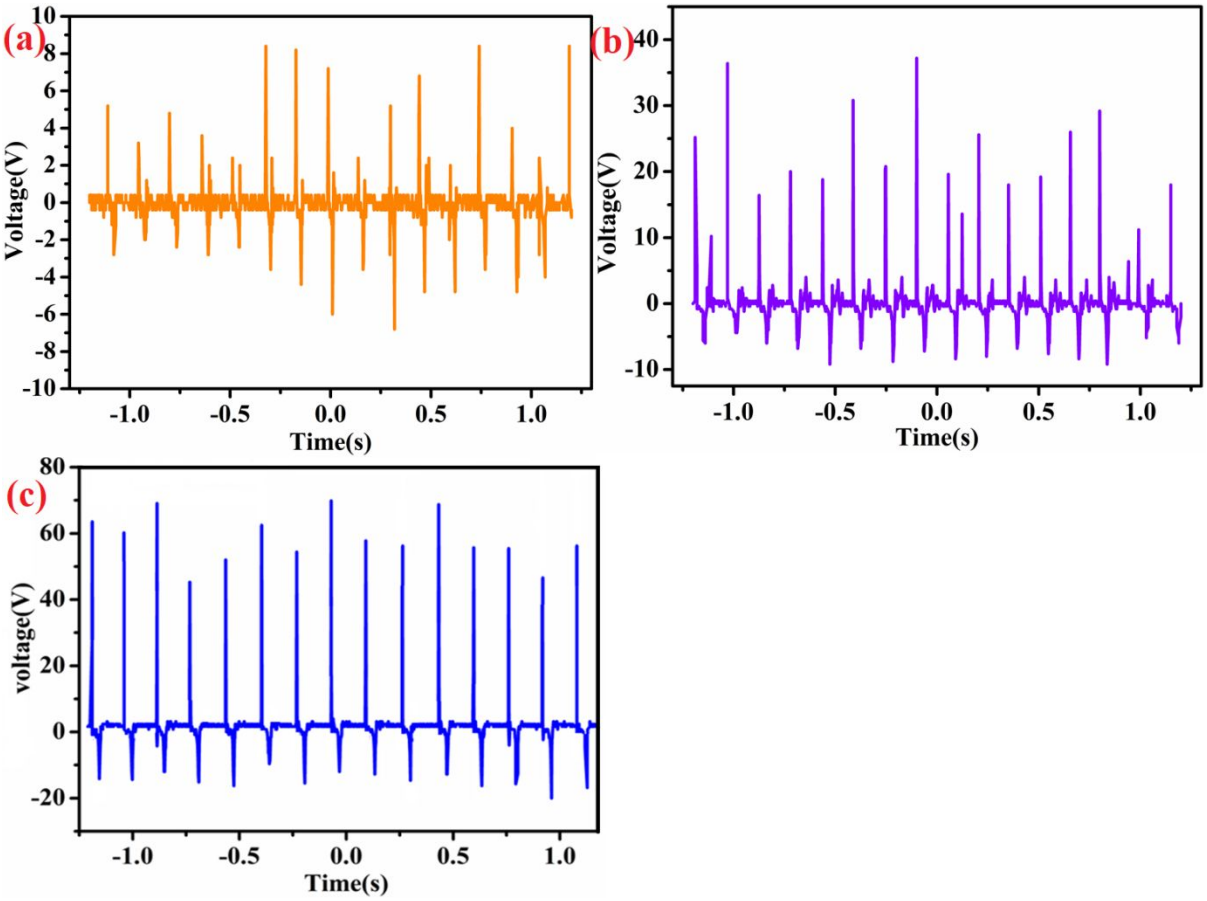

Fig. S2 Electrical measurements of 0.4 wt % hBN-PVDF nanofiber mat-based PENG with varying active area of device (a) 1 cm x 1cm (b) 1 cm x 2 cm (c) 1 cm x 3 cm.

3. Quantification of applied mechanical stress (σ) on the device by finger tapping:

When the device is tapped by fingers the charges are generated due to the momentum imparted. On the basis of kinetic energy and momentum theorem, following equation is used to determine the applied pressure on the device surface:

$$m.g.h = \frac{1}{2}(mv^2) \qquad (4)$$

$$(f - m.g).\Delta t = m.v \qquad (5)$$

$$\sigma = \frac{f}{a} \qquad (6)$$

Where *m*- mass of the object, *g*- gravitational acceleration, *h*- falling height of the object, *v* is the velocity, σ– applied stress, a- contact surface area of the device, f- force of contact, Δt is the time interval between two consecutive taps.

The average mass estimated of the object (m) is $m_1 \sim 0.24$ kg, $m_2 \sim 0.31$ kg and $m_3 \sim 0.47$ kg for soft, medium and hard tap respectively as measured from an electric balance, approximate active area (a) over which the pressure was applied is 3 cm^2 and $\Delta t \sim 0.16$ sec. The average falling height (h) ~ 0.05 m and g = 9.8 N/Kg. All these values are used to calculate force and stress imparted to the FNG. The as calculated force values $f_1 \sim 3.8$ N, $f_2 \sim 4.8$ N and $f_3 \sim 7.4$ N with corresponding values of stress as $\sigma_1 \sim 12.6$ KPa, $\sigma_2 \sim 16$ KPa and $\sigma_3 \sim 24.5$ KPa.

4. Graph showing voltage vs. time of capacitor, charged through tapping of PENG.

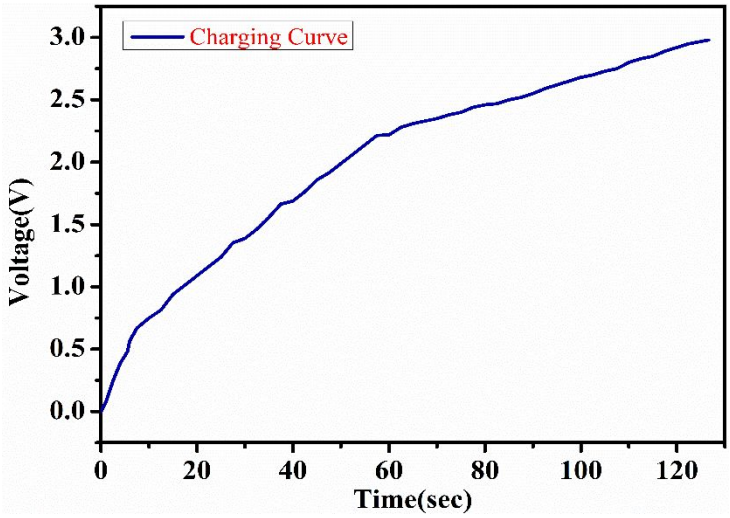

Fig. S3. Charging curve for capacitor showing voltage vs. time.

5. Detailed calculation of cost per hBN-PVDF nanofiber mat-based PENG.

1. Cost of chemicals used per device

1. Boric acid (0.5 M):- $ 0.013
2. Urea (1 M):- $ 0.006
3. PVDF pellets (16 wt %):- $ 0.15
4. DMF (2 ml):- $ 0.045
5. Acetone (1 ml):- $ 0.011
6. Ethanol (1 ml): - $ 0.0036

2. Cost of insulating material and electrodes

1. Copper foil (1 cm x 5 cm): - $ 0.048
2. Kapton tape (2 cm x 10 cm): - $ 0.012

Cost per PENG device: - Cost of chemicals used + cost of electrodes and insulating material = $ 0.28