Supporting Information

Unusual nanoscale piezoelectricity driven high current generation from self S-defect neutralised few layered MoS_2 nanosheets based flexible nanogenerator

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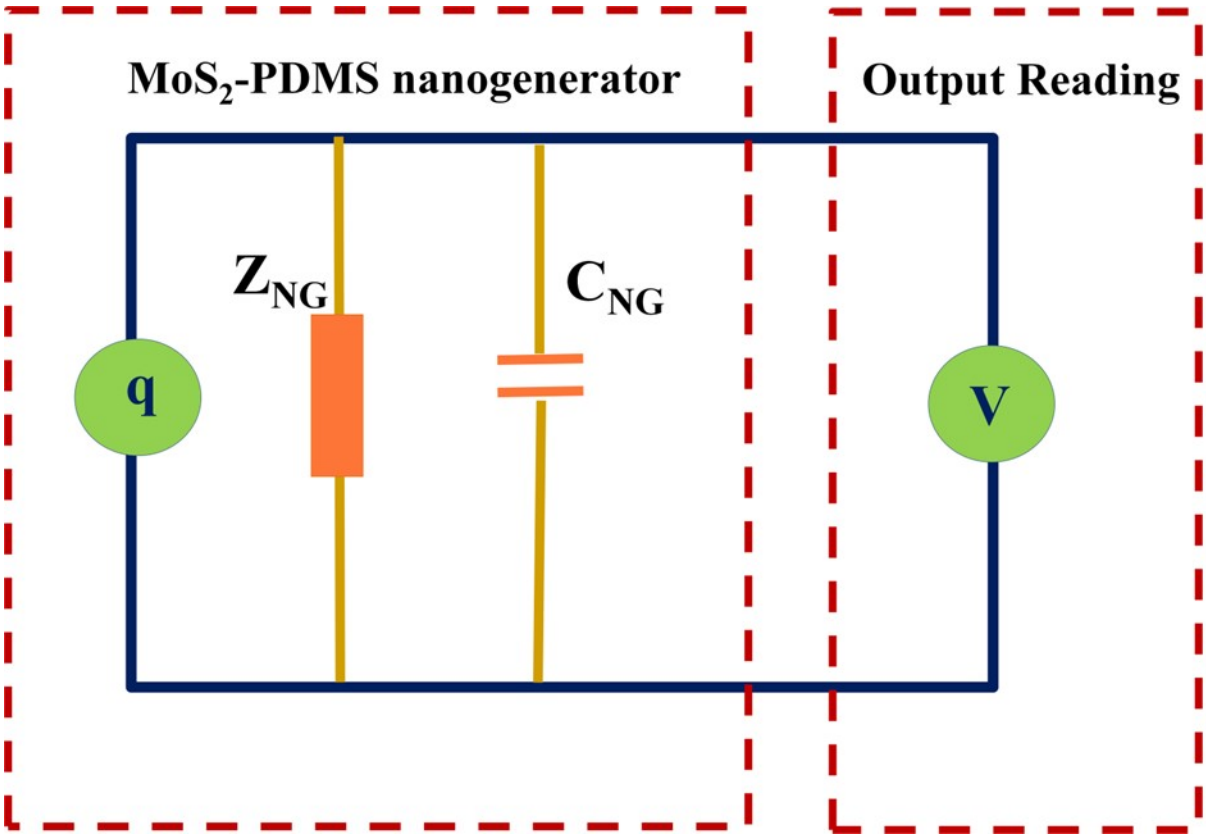

Figure S1. Equivalent-circuit diagram of MoS2-PDMS nanocomposite based piezoelectric nanogenerator device.

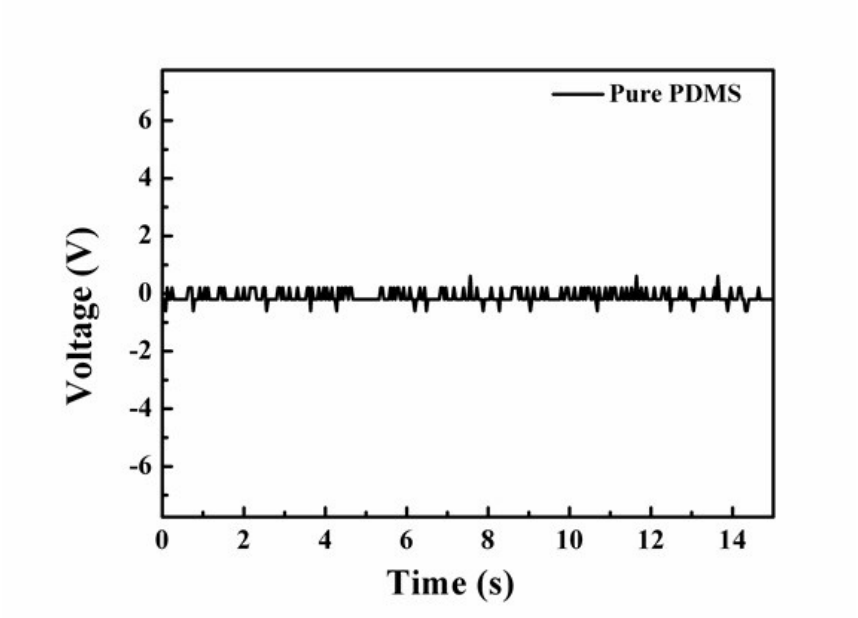

Figure S2. Output voltage obtained from pristine PDMS based nanogenerator under same vertical compressive force.

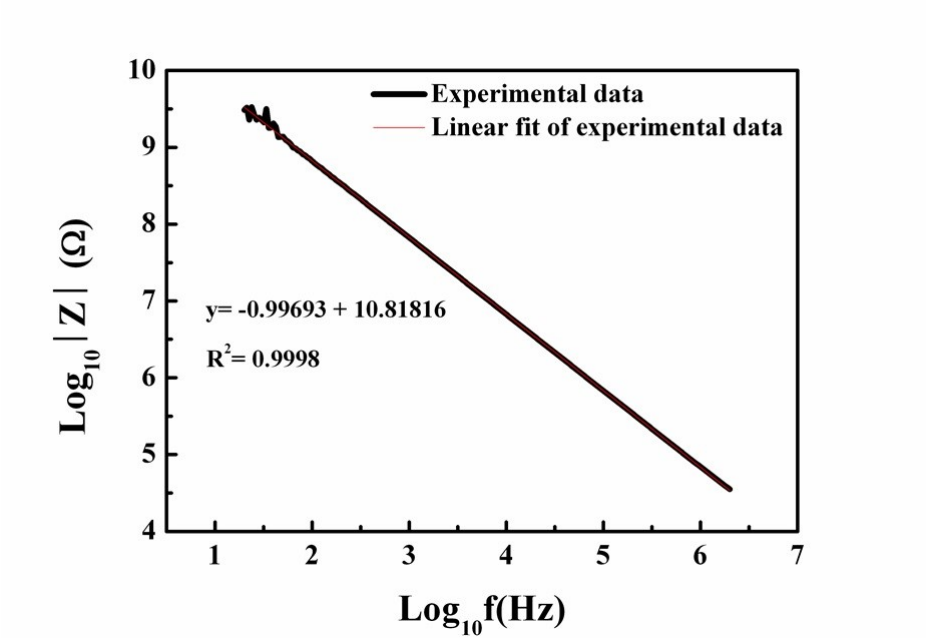

Figure S3. Impedance-frequency curve of the MoS_2-PDMS based nanocomposite based nanogenerator

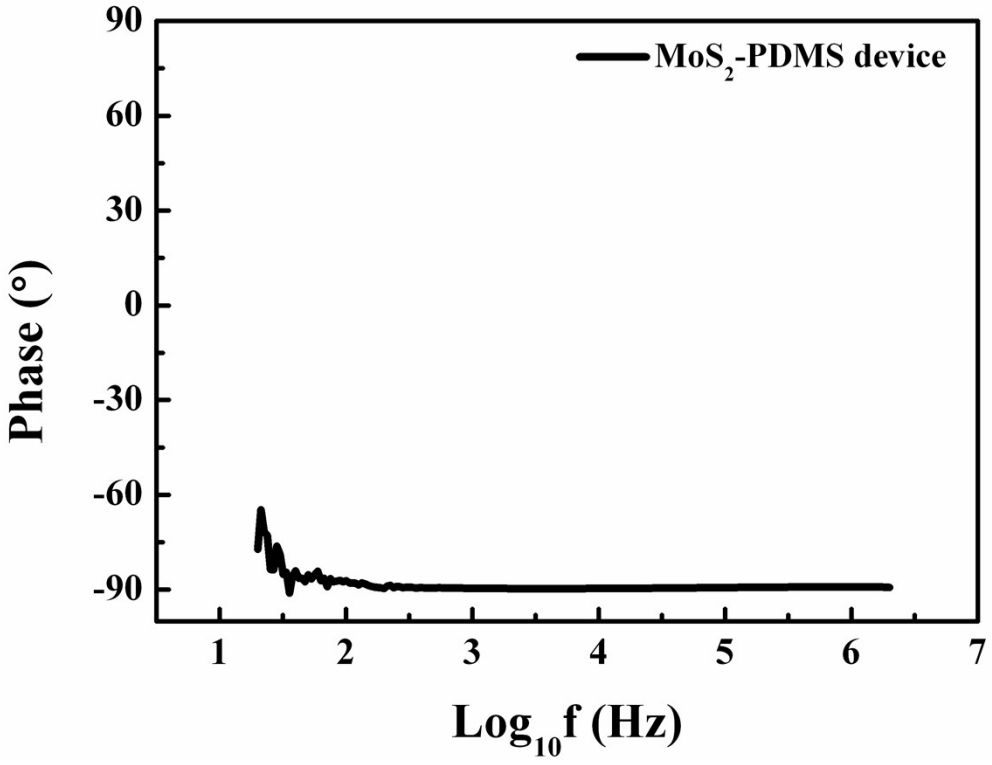

Figure S4. Variation of phase (theta) with applied frequency of the nanogenerator device.

Energy conversion efficiency.

The performance of the piezoelectric nanogenerator with d_{33} and dielectric constant is related to the piezoelectric voltage constant (g_{33}) by following equation

$V=g_{33}\varepsilon E$, (1)

where E is Young's modulus of material and ε is the strain. Also, the d_{33} is directly proportional to g33 and mathematically the can be expressed as

$$g_{33} = \frac{d_{33}}{\varepsilon_0 K} \quad (2)$$

Where, $\varepsilon_o$is free space permittivity and K is the relative dielectric constant of MoS_2 nanosheets based device. Eq.(2) clearly indicates the enhancement in piezoelectric output voltage is due to the high d_{33}, moreover the high d_{33} is due to the high electric polarisation cause by high with dielectric constant of the MoS_2 nanosheets. It is worth to point out that low dielectric constant of MoS_2-PDMS nanogenerator device is due to the low value of dielectric constant of PDMS (2.5). The average efficiency of energy conversion estimated by dividing output electrical energy (15.4 X 10^{-6}) with strain energy (0.512 x10^{-6}J).[1-2] The efficiency of the few layered flexible MoS_2 based nanogenerator device was calculated and found to be 30.07%.

References

1. C. Chang, V. H. Tran, J. Wang, Y-K Fuh and L. Lin, *Nano Lett.*, 2010, **10**, 726-731.

2. H. Li, C. Tian, Z.D. Deng, *Appl. Phy. Rev.,* 2014**, 1,** 041301.