

## Sound-driven Textile Based Hybrid Nanogenerator with Enhanced Piezoelectricity by Electrostatic Effect

### Calculation of piezoelectric potential $\varphi$ of the n-doped ZnO NWs

Theoretically, the piezoelectric potential  $\varphi$  of the n-doped ZnO NWs can be described as below,

$$\kappa_{ik} \frac{\partial^2}{\partial x_i \partial x_k} \varphi = -(\rho^R - en + eN_D^+) = \rho^{total} (\sigma) \quad (1)$$

where  $\kappa_{ik}$  is the dielectric constant,  $n$  is the electron concentration in the conduction band,  $N_D^+$  is the ionized donor concentration,  $\rho^R$  is the piezoelectric charge density ( $\rho^R = -\nabla \cdot e_{kq} \varepsilon_q \hat{i}_k$ ),  $e$  is the electron charge, and  $\rho^{total}$  is the total charge density as a function of surface charge density imposed. The piezoelectric potential can be obtained by solving the 2<sup>nd</sup> order differential equation (1).

**Fig S1: The surface potential measurement;** Measured surface potential on the PE film after the PE film is contacted with Au electrode and ZnO NWs. Both sides show the similar surface potential. The calculated surface charge density of PE film was  $-2 \times 10^{-4} \text{ C/m}^2$ .

**Fig S2: The vibrated amplitude and output voltage of textile hybrid nanogenerator;** **a** The vibrational amplitude of textile substrate with the sonic input power of 80 dB, 85 dB, 90 dB, 95 dB, 100dB, respectively, **b** The output voltage of textile hybrid nanogenerator with the sonic input power of 80 dB, 85 dB, 90 dB, 95 dB, 100dB, respectively.

**Fig S3: The polarity switching tests;** The polarity tests of **a** a textile ZnO piezoelectric nanogenerator and **b** a textile electrostatic/piezoelectric hybrid nanogenerator with applying pressure to the device by finger. The sign of output voltage were switched when

the direction of probe polarity was changed.

**Supplementary Movie 1: The operation of green LED** A green LED was operated by connecting LED leads to DC OUTPUT by applying sonic wave of 100 dB at 100 Hz.

**Supplementary Movie 2: The operation of LCD panel** A LCD panel was operated by applying sonic wave of 100dB at 100Hz

**Fig. S1**

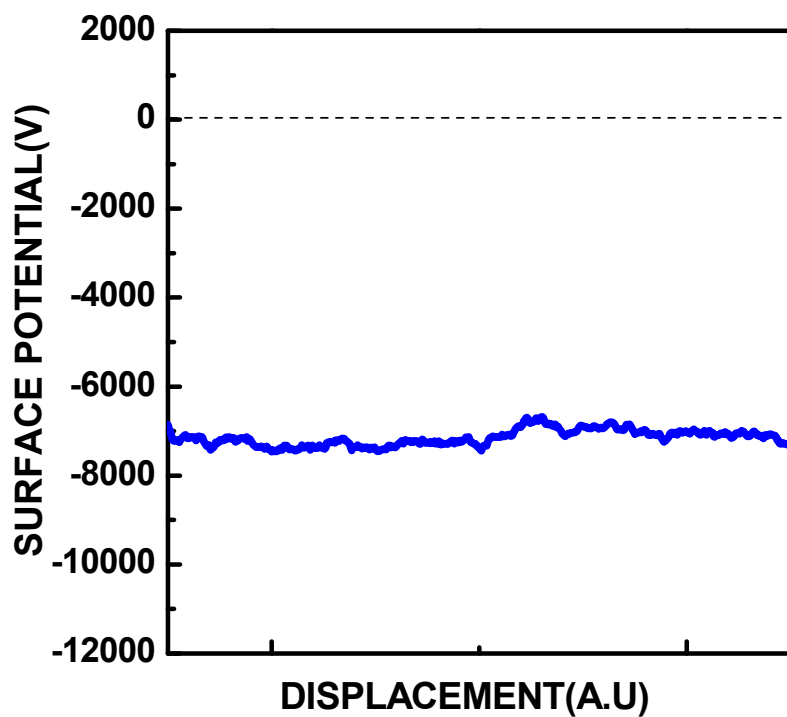


Fig. S2

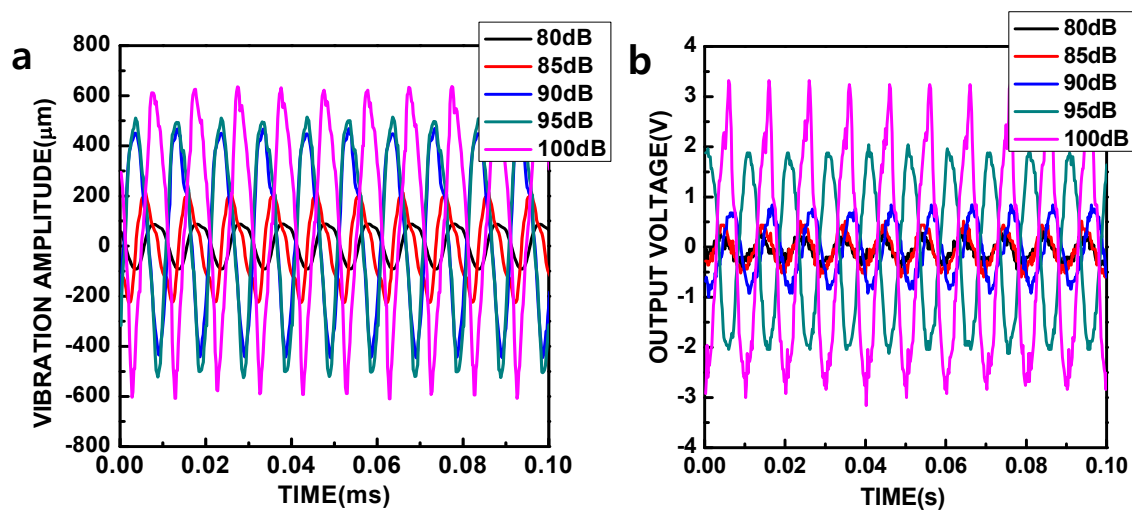
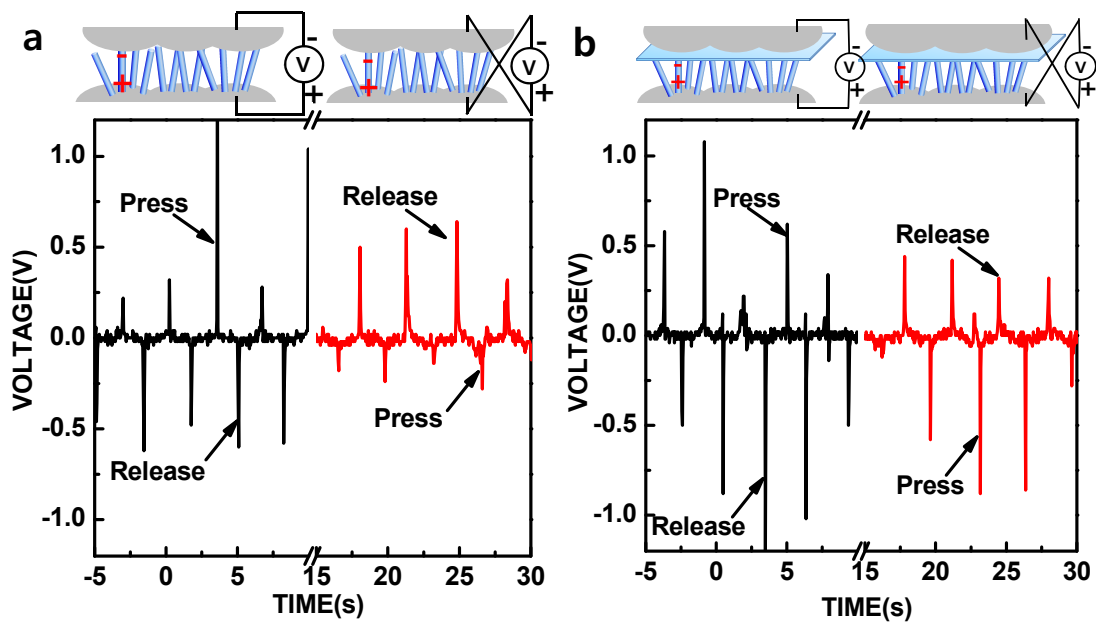


Fig. S3



Supplementary Movies were submitted as avi files.