Supplementary Information

Flexible high-output nanogenerator based on lateral ZnO nanowire array

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Experimental setup

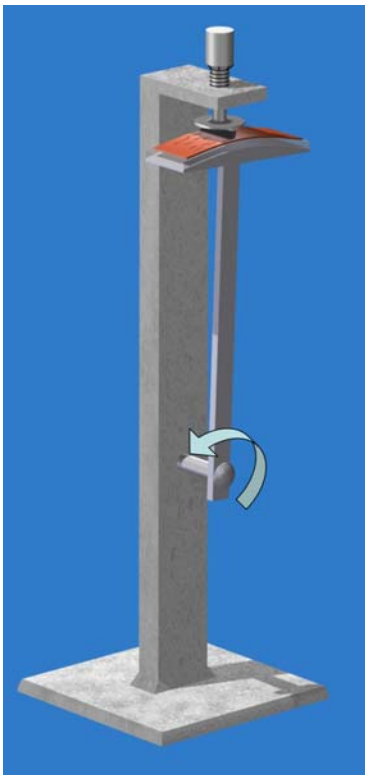

Figure S1. Schematic setup for transferring horizontally aligned ZnO NW arrays onto a flexible substrate from vertically grown NWs. The stage that supports the flexible substrate is free to move in a circular manner.

NW growth direction characterization

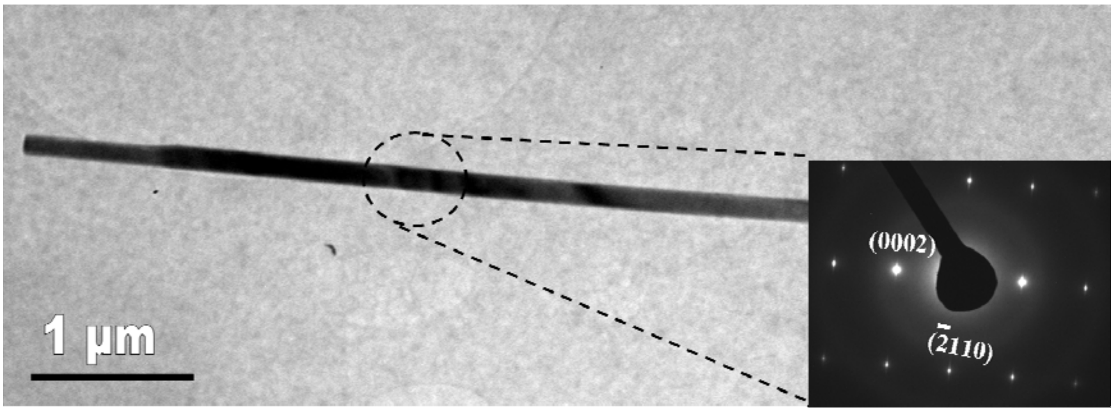

Figure S2. Transmission electron microscopy image of an as-synthesized ZnO NW. The NW is a single crystal and has a diameter of ~200 *nm*. Inset: An electron diffraction pattern from the NW, showing that the growth direction is along the *c*-axis.

Durability test

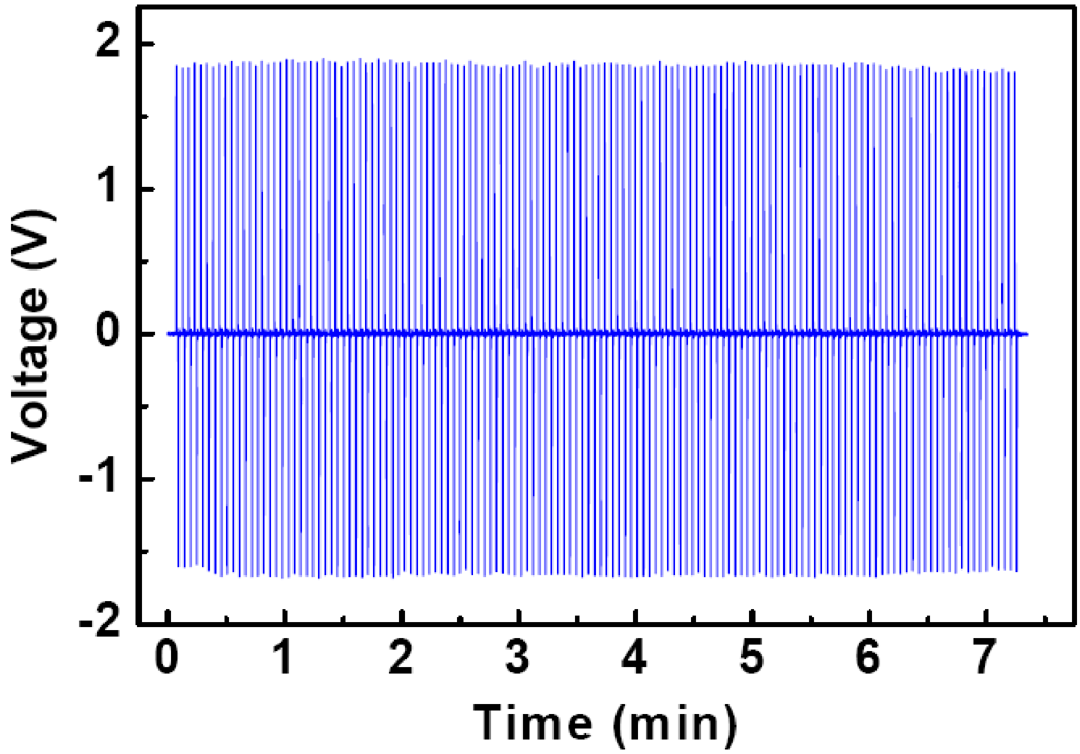

Figure S3. Result of the durability test on the output of the HONG. The magnitude does not show any appreciable decay after more than 7 minutes of operation, showing good stability and robustness of the HONG.

Voltage linear superposition test

600 rows of ZnO NWs are divided into two sections, which are in serial. The voltage output from the respective section is indicated with "Ⅰ" and "Ⅱ" in the Fig. S4. The sum of the output from those two individual sections matches the overall output of the whole device, which corresponds to "Ⅰ+Ⅱ" in the Fig. S4.

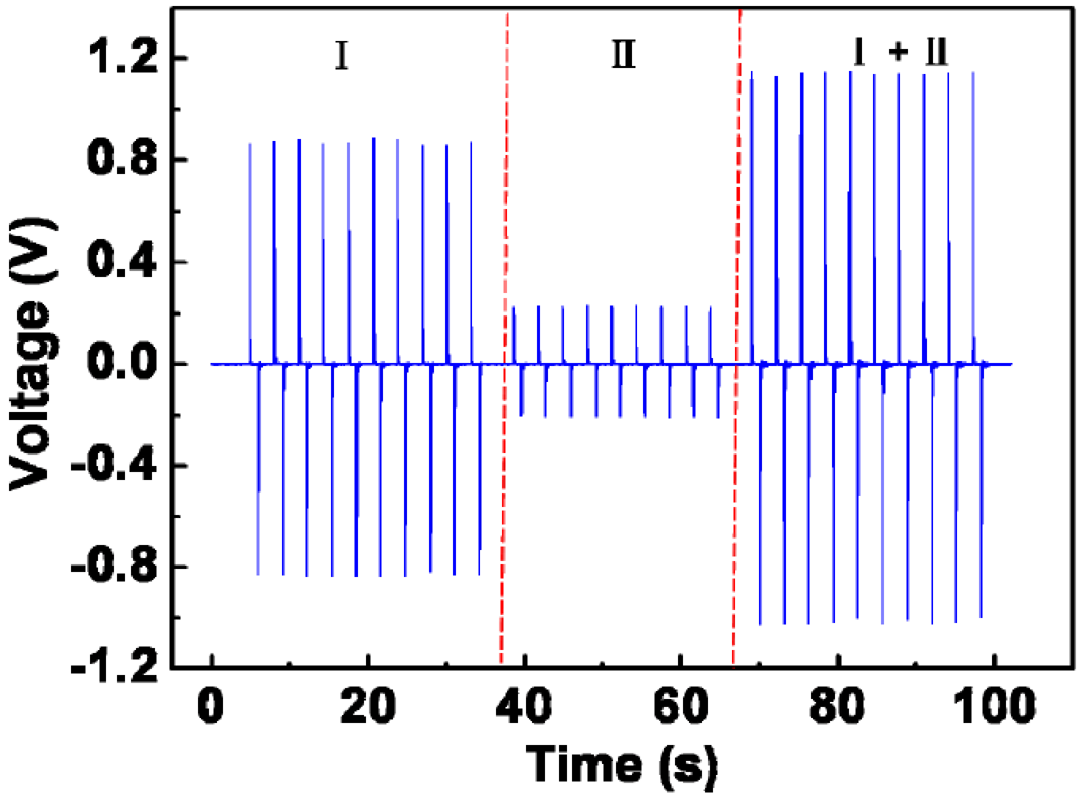

Figure S4. The linear superposition test of the voltage output.

Factors that affect the amount of the stored electric energy

It is worth noting that the converted electric energy may not equal to the energy stored by the capacitors. The factors that may lead to the energy loss are summarized below.

1. Rectifying bridge

The integrated rectifying bridge is composed of four p-n junction diodes. To characterize its performance, a triangle voltage input was provided by a functional generator (peak value of 2 *V* and 0.5 *Hz*); and the output was measured (Fig. S5). The measured peak signal falls short of 2 V (line A and line B), which is likely attributed to the threshold of the diodes. The difference between line A and line B may be associated with the asymmetric behavior of the rectifying bridge, which is probably originated from the different threshold of the diodes. Line C demonstrates the reverse leakage of the diode, as pointed by the arrowhead.

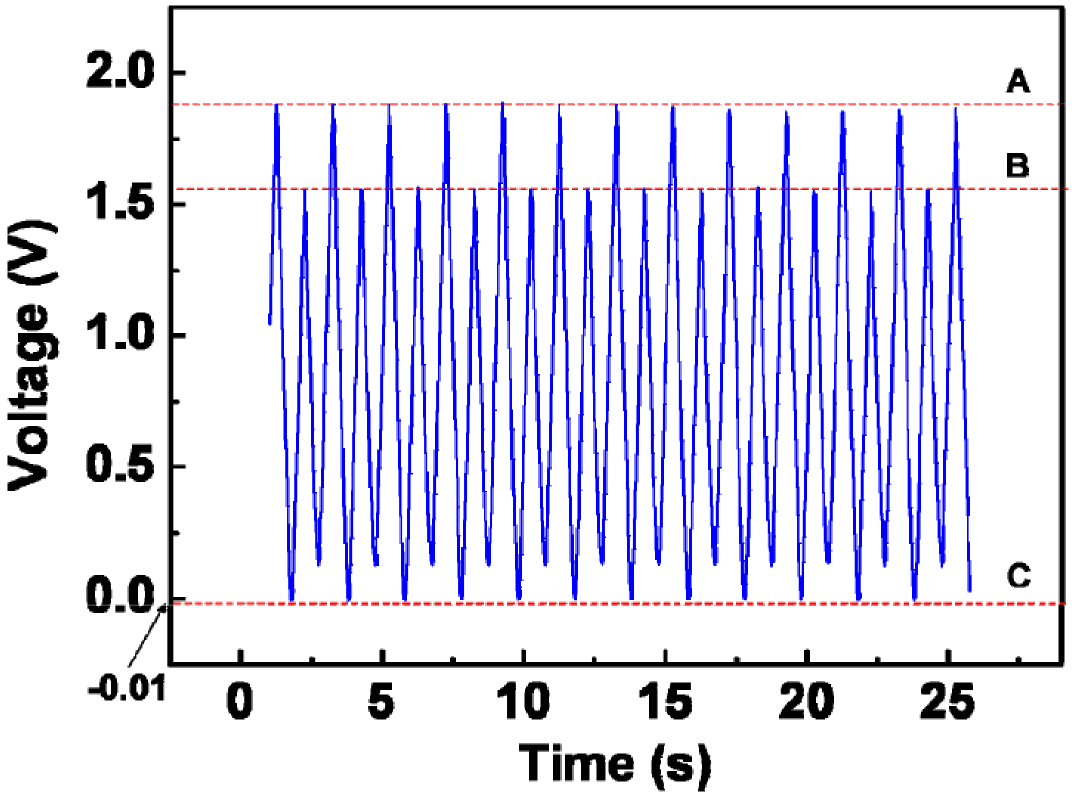

Figure S5. Voltage output measured after the rectifying bridge with input (0.5 *Hz* of triangle voltage signal with peak value of 2 *V*) provided by a functional generator, showing that the threshold and reverse leakage of the diodes contribute to some energy loss.

2. Capacitors

The energy may be lost in two forms: the Joule heating due to the finite conductivity of the dielectric medium and the dielectric dissipation due to the nonstatic charging input.

3. Circuit

The resistance of the circuit leads and connections may also contribute to some Joule heating and energy lost.

Video

Live video played at real time showing the lighting up of an LED by the charges generated by a nanogenerator and stored in capacitors.