Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information

Device characterization:

Before patterning our devices, we verified the quality of graphene using Raman spectrum. Fig S1 shows the Raman spectra of our graphene sample. The ratio of 2D/G peak and the small D peak indicates single layer graphene with limited defeats.

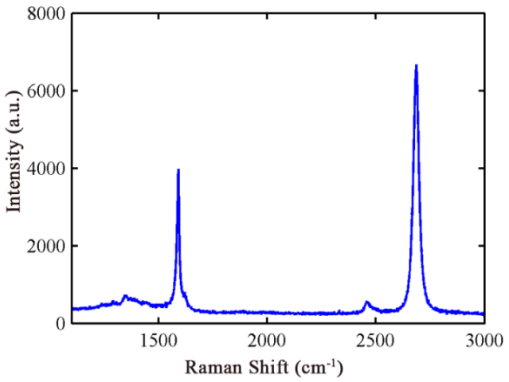

Figure S1: Raman Spectrum of the sample.

Temperature difference:

The extracted temperature difference between the hot and the cold sides of the GNRs for various heater currents are shown in figure S2. The change in resistance of the hot and cold sides were converted to temperature difference using the following equation:

$$\Delta T_{h,c} = \left(T_f - T_o\right) = \frac{R_f - R_o}{R_o \alpha}, \quad (1)$$

where R_f is resistance at temperature T_f, R_O is the resistance at temperature T_o and α is the temperature coefficient of the resistance of the electrode material. We used known temperatures to calibrate the value of α. Our experimental determined value of α is 0.0024/K which is close to the reported value of α for gold of 0.0034/K.

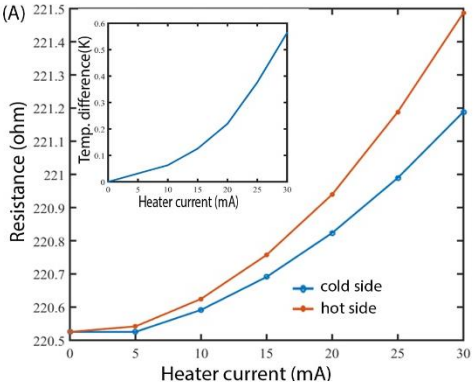

Figure S2: Value of the resistance of the electrodes magnitude of heater current. The inset shows the temperature difference extracted from the change in resistance of the hot and cold sides.

Thermopower measurement:

We applied small heater voltage so that we remain in the linear region. However, the generated thermovoltage was small and buried in noise which couldn't be measured using DC technique. So, we adopted the popular AC measurement technique. For, the structure used, we extracted the response time of the thermovoltage to be in the order of 100ms. So. We required very low frequency heater power. We used frequency from 1-5Hz in our measurement. This required very long time constant to stabilize the thermovoltage. On the other hand, when we apply gate voltage, the effect of the gate voltage get neutralized within milliseconds due to ambient effect. As a result, we couldn't measure gate voltage dependent thermopower. However, there is no limitation for conductance measurement which can be done at very high speed. So, we successfully extracted gate voltage dependent conductance.