Supporting information

for

Novel charge transport in DNA-templated nanowires

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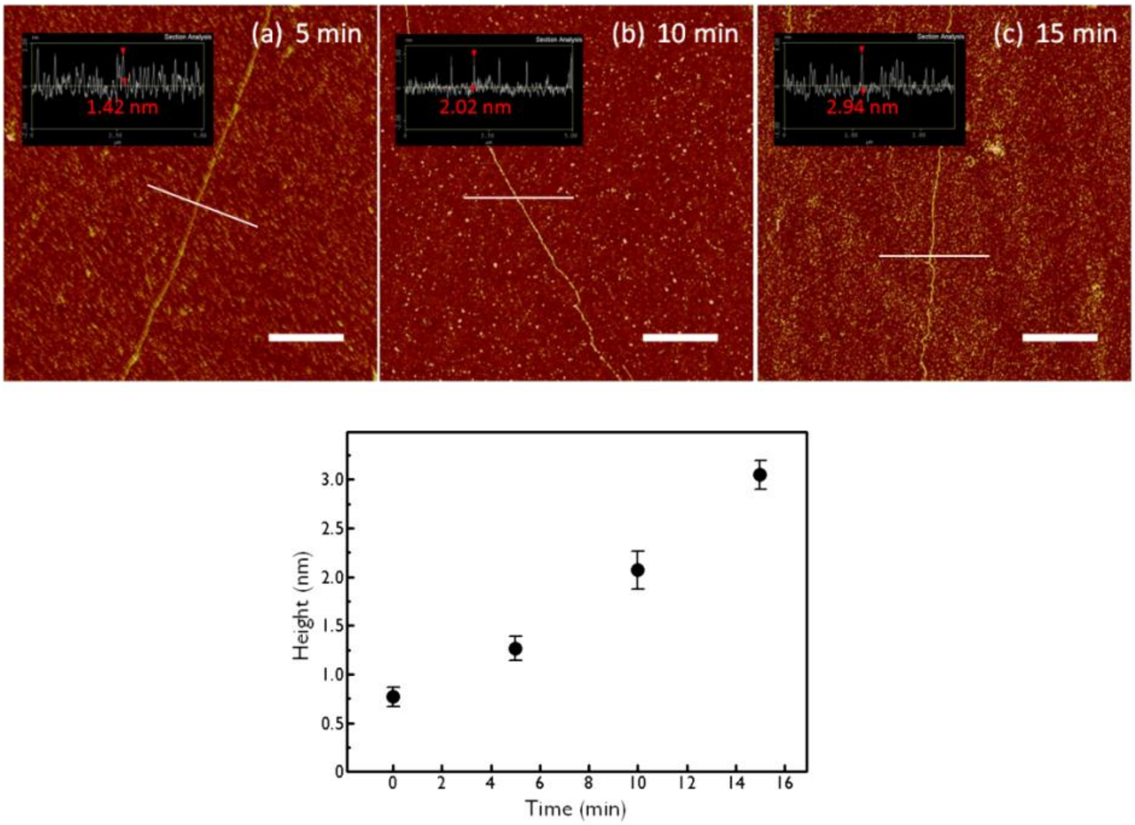

Fig. S1 Typical AFM images of the DNA-templated polyaniline nanowires obtained by photopolymerization for 5 min (a), 10 min (b), and 15 min (c), respectively (top), and plots of the height of DNA template as a function of photopolymerization time (bottom). Image scale bar: 1.0 μm. The height values were calculated based on AFM analyses of numerous nanowires.

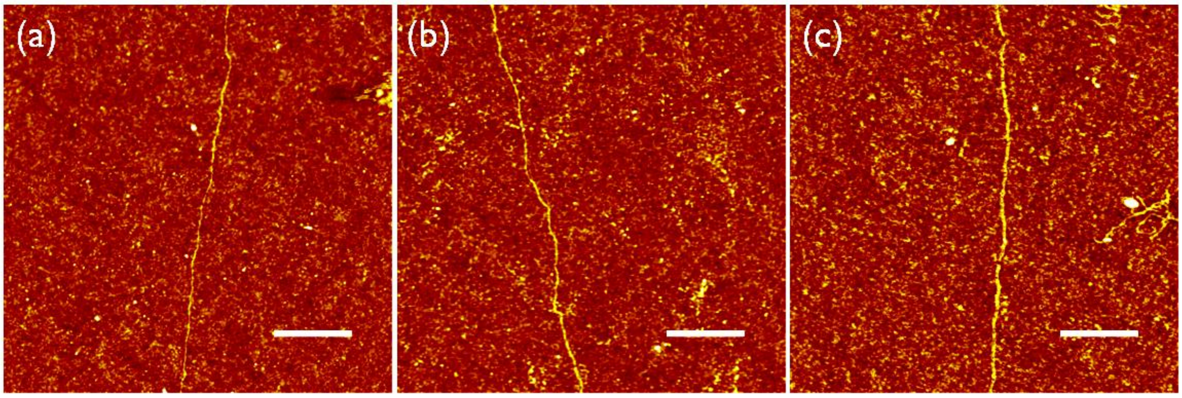

Fig. S2 AFM images of DNA after immersion in the polymerization precursor solution for 5 min (a), after immersion in polymerized polyaniline solution for 5 min (b), and after immersion in light-irradiated polymerization solution for 5 min (c), respectively. To acquire (b), the polymerized polyaniline solution was obtained by photopolymerization for 5 min. Polyaniline adsorption then made the height of DNA slightly increase. The results indicate that the interaction between $Ru(bpy)_3^{2+}$ and DNA facilitates the extension of polyaniline along DNA template. Scale bar: 500 nm.

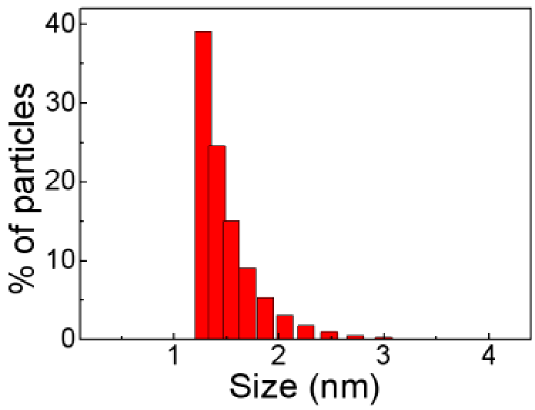

Fig. S3 Size distribution of the AuNPs characterized with dynamic light scattering.

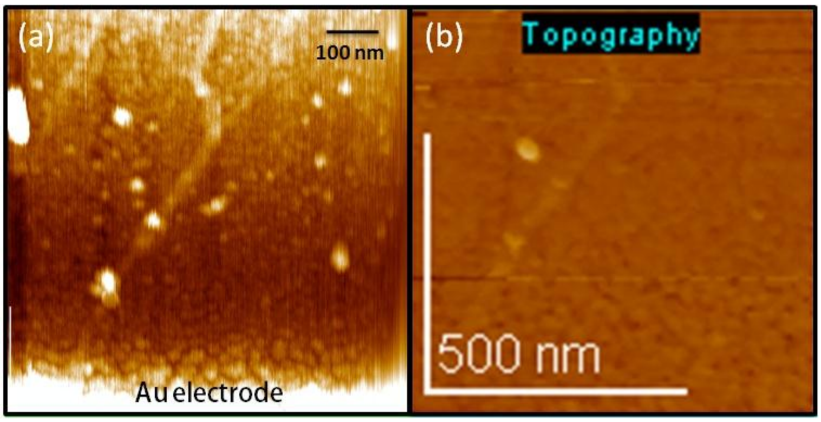

Fig. S4 AFM images of the DNA-templated polyaniline nanowires (a) before and (b) after the PCI-AFM measurement, respectively.

- ***Fit results of the I-V data to equations representing conduction mechanisms***

(I) The relation of Coulomb blockade,

$$\ln(I) = \alpha \ln(V - V_{th}),$$

was found to match well the *I-V* characteristics of the AuNP/polyaniline-alterntated nanowires. The noncurrent gaps of these *I-V* curves obtained have the same span of 2.41 *V* in the range of applied bias voltage -1.07−1.34 V (A), -1.23−1.18 V (B) and -0.84−1.57 V (C), respectively. For each $\ln(I)$-$\ln(V-V_{th})$ group plots, the linear fit of the data yields comparable α (0.98, 1.13 and 1.07, respectively). The linear correction coefficients generated were 0.93, 0.91 and 0.96, respectively.

(II) The electron transport mechanism for the conduction of polyaniline nanowires was identified to be Schottky emission, as determined by fitting the *I-V* curves to the following relation:

$$\ln(I) = \beta\sqrt{V} + \gamma,$$

where β and γ are the fitting parameters. The linear fit of the data generated β = 4.08 (D), 4.49 (E) and 5.86 (F), with γ = -4.52 (D), -3.88 (E) and -6.57 (F) for the corresponding *I-V* curves, respectively. Accordingly, the linear correction coefficients were calculated to be 0.98, 0.98, and 0.97, respectively for the corresponding *I-V* curves.