

Electronic Supplementary Material

Aligned Graphene Nanoribbons and Crossbars from Unzipped Carbon Nanotubes

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1. Diameter, height and width distribution of the starting CNTs and obtained GNRs

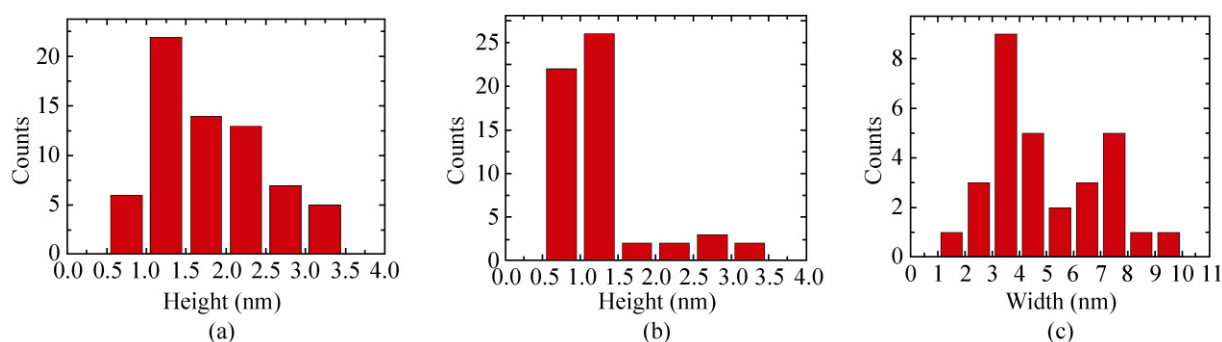


Figure S-1 (a) Diameter distribution of starting CNTs. Height (b) and width (c) distributions of obtained GNRs. The average height of the GNRs was ~0.4 nm lower than that of the pristine CNTs. The widths of all the GNRs were <10 nm

2. AFM images taken along one GNR

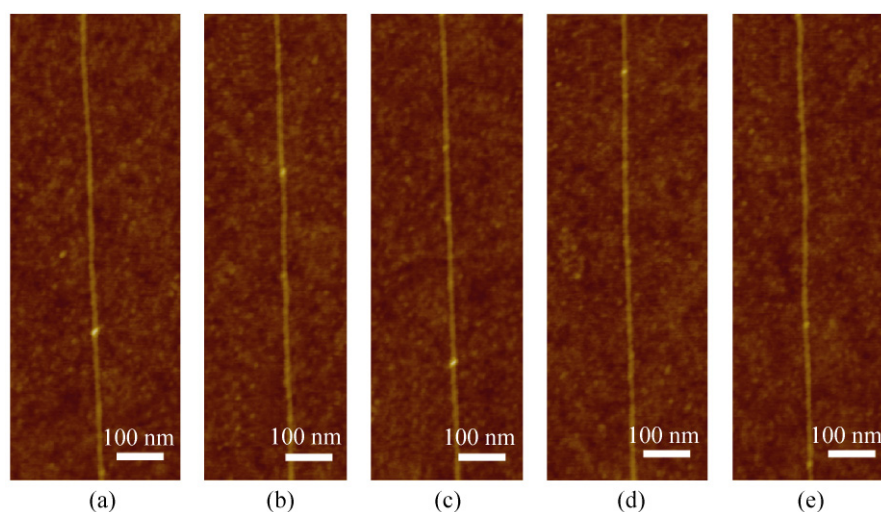


Figure S-2 AFM images taken at different positions along a 7 nm wide GNR. The GNR showed smooth edges and the width of the GNR was very uniform along its length

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3. Raman G-band image and spectra of array and individual GNRs

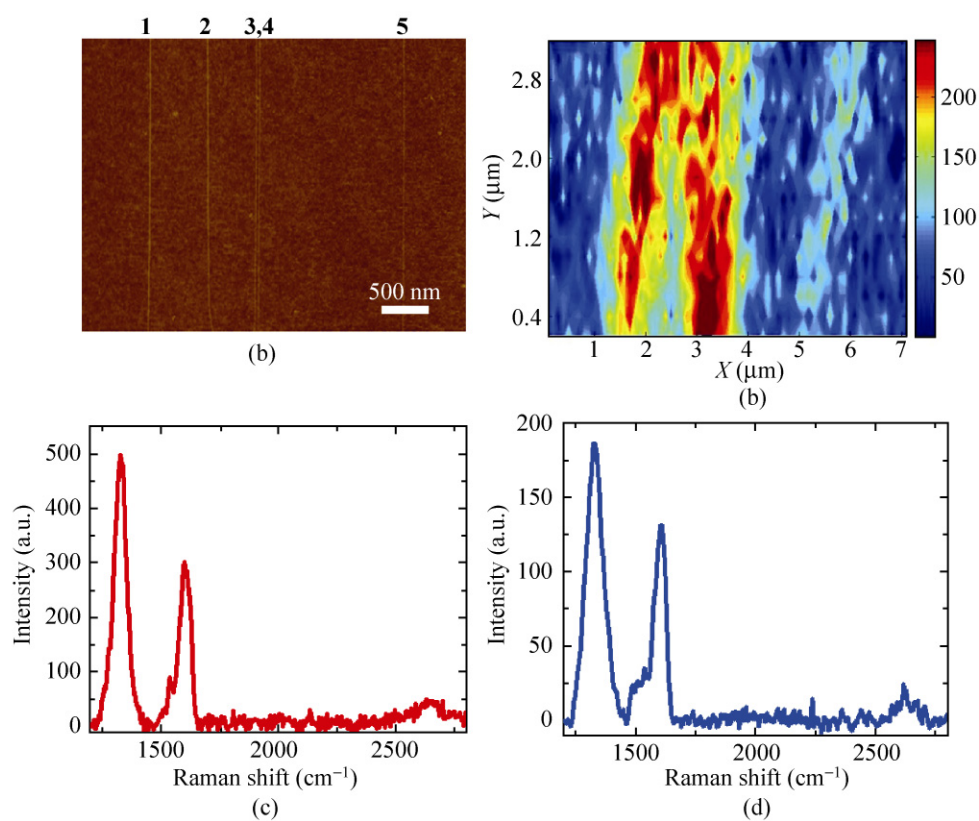


Figure S-3 AFM (a) and Raman G-band image (b) of the same GNR arrays. The GNR marked **5** in (a) was clearly resolved in the Raman G-band image, but the other four GNRs could not be resolved individually due to the short distances between them. Raman spectra of (c) GNRs **1–4** and (d) GNR **5**. The I_D/I_G ratios of GNRs **1–4** and GNR **5** were 1.7 and 1.5, respectively

4. Crossbars of GNR–CNT and CNT–CNT

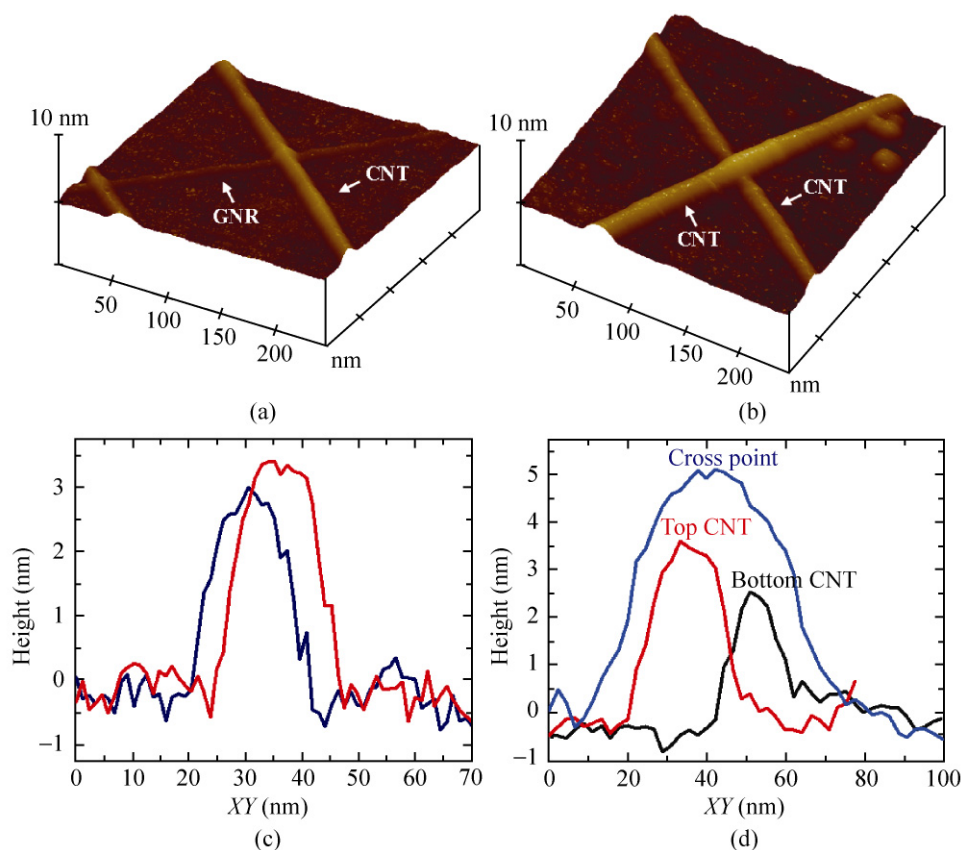


Figure S-4 (a) An AFM image of GNR–CNT crossbars. Two CNTs with diameters ~ 1.7 nm (left) and 2.2 nm (right) were placed on the top of a ~ 5 nm wide GNR (height: ~ 0.9 nm). (b) An AFM image of a CNT–CNT crossbar. The diameters of the top tube was ~ 3.5 nm and that of the bottom tube ~ 2.5 nm. (c) Topographic section along the CNT shown in Fig. 4(d) at the GNR–CNT cross point (blue curve, height: ~ 3.0 nm) and ~ 100 nm away from the junction (red curve, height: ~ 3.3 nm), showing a radial deformation of ~ 0.3 nm at the cross point. (d) Topographic section analysis of the CNT–CNT junction shown in (b). The height of the cross point was ~ 5.0 nm, significantly lower than the sum of the diameters of the two tubes (~ 6.0 nm) due to the radial deformation of the two tubes at the cross point