

Supplementary Materials

Direct patterning of highly-conductive graphene@copper composites using copper naphthenate as a resist for graphene device applications

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This file includes:

Fig. S1 to S5

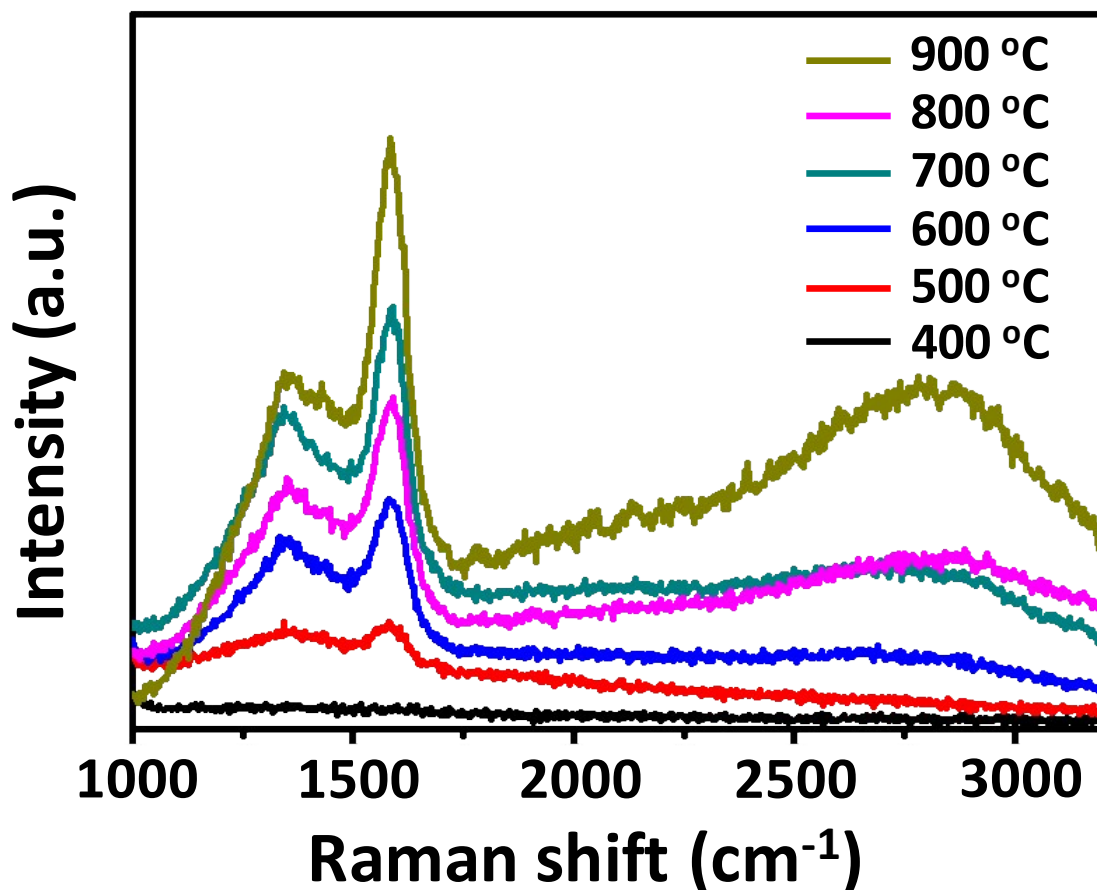


Fig. S1 Raman spectra of the annealed copper naphthenate thin films coated on SiO₂ substrate, which were heated to 400 °C, 500 °C, 600 °C, 700 °C, 800 °C and 900 °C with the rate of 30 °C min⁻¹ and annealed for 10 min. Then the samples were fast cooled to room temperature in the hydrogen atmosphere.

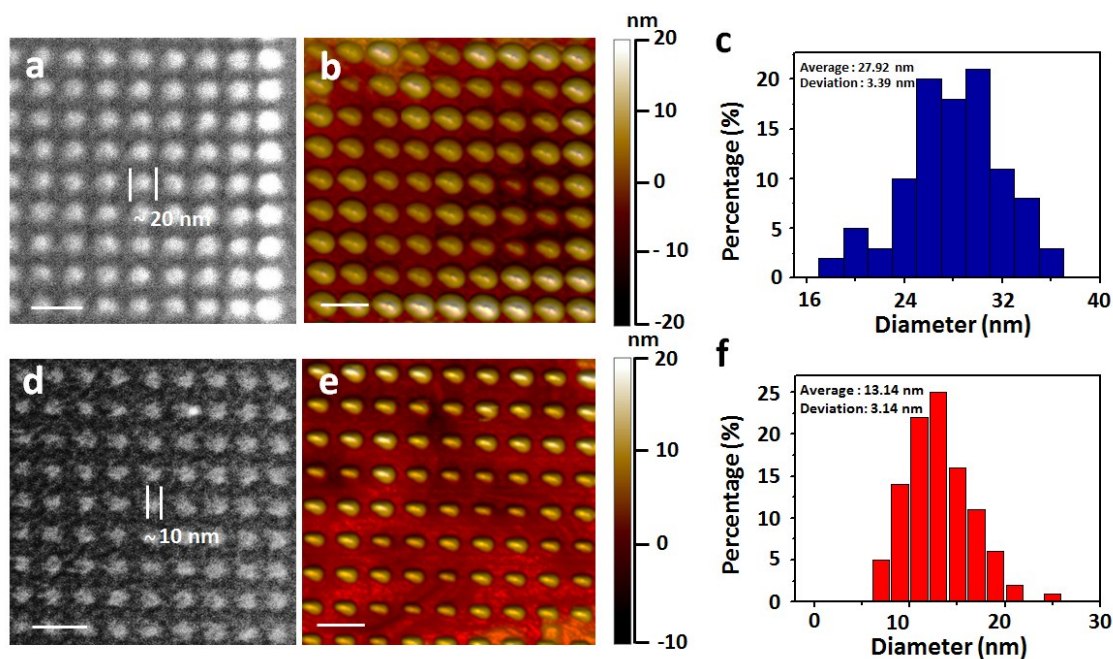


Fig. S2 (a,d) SEM images of a dot array fabricated by electron beam lithography (EBL) and annealing process. (b,e) Topographic atomic force microscopy (AFM) images of arrayed patterns corresponding to the dot array in (a,d), respectively. (c,f) Statistic histogram of the height of dot array in (a,d), respectively. Scale bar: (a,b,d,e) 50 nm.

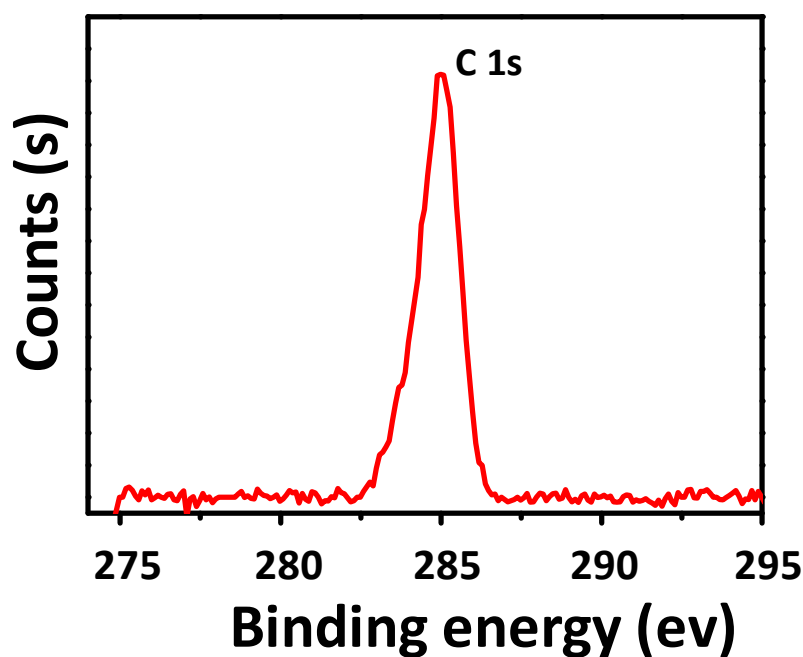


Fig. S3 X-ray photoelectron spectroscopy (XPS) spectrum of carbon element in the annealed thin film sample.

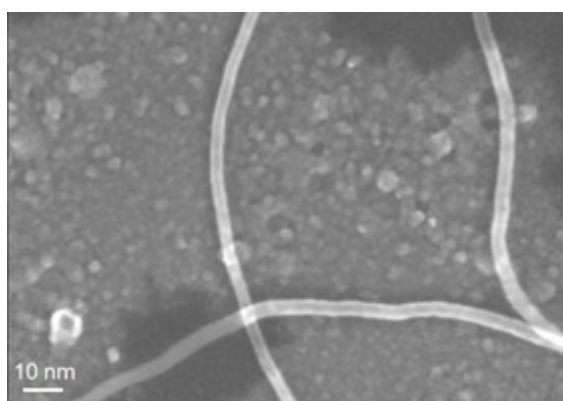


Fig. S4 Scanning-electron microscopy (SEM) images of the annealed copper naphthenate thin film coated on SiO₂ substrate at 1000 °C, showing the growth of carbon nanotubes.

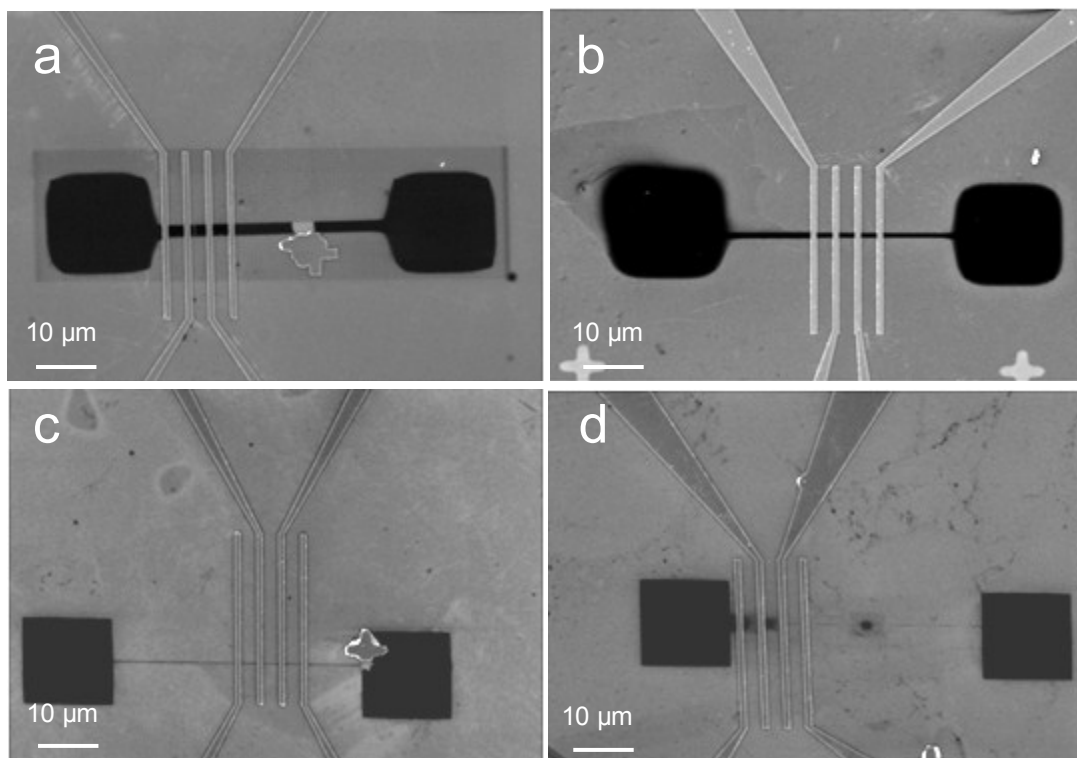


Fig. S5 Four copper naphthenate lines with different width for investigating the conductivity of copper@graphene. (a-d) The copper naphthenate lines with different width. The width of lines are 1200 nm, 550 nm, 70 nm and 30 nm, respectively.