Supporting information

Figure S1. Curve fitting of the Au 4f core level spectrum after 1 hr of annealing at 400 °C (at P1) for a Gaussian width of 0.72 eV, a Lorentzian line width of 320 meV, and an asymmetry factor of 0.05.
**Figure S2.** (a) SPEM image (600 × 600 μm²), contrasted by Si 2p peak intensities, of the sample before annealing. Annealing time dependences of SPEM images (600 × 600 μm²), contrasted by Si 2p peaks, at 400 °C: (b) 15 min, (c) 1 hr, (d) 2 hrs, (e) 3 hrs, and (f) 5 hrs.
Figure S3. (a) SPEM image (600 × 600 μm²), contrasted by O 1s peak intensities, of the sample before annealing. Annealing time dependences of SPEM images (600 × 600 μm²), contrasted by O 1s peaks, at 400 °C: (b) 15 min, (c) 1 hr, (d) 2 hrs, (e) 3 hrs, and (f) 5 hrs.
Figure S4. Plots of the total resistances versus spacing between two Au electrodes, (a) Au-Si contact after removing the SiO$_x$ layer by catalytic oxidation (named T). Before annealing the Graphene/Au layer on the SiO$_x$/Si surface was patterned by ion sputtering method. (b) Au on the SiO$_x$/Si surface without treatment (named N). Insets in (a) and (b) show the Au pattern (width ($W$) $\times$ length ($d$): $100\times100$ $\mu$m$^2$, spacing ($L$): 100, 200, 300, 400, and 500 $\mu$m).