

Observation of well-defined Kohn-anomaly in high-quality graphene devices at room temperature (Supplementary Information)

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(Dated: August 31, 2022)

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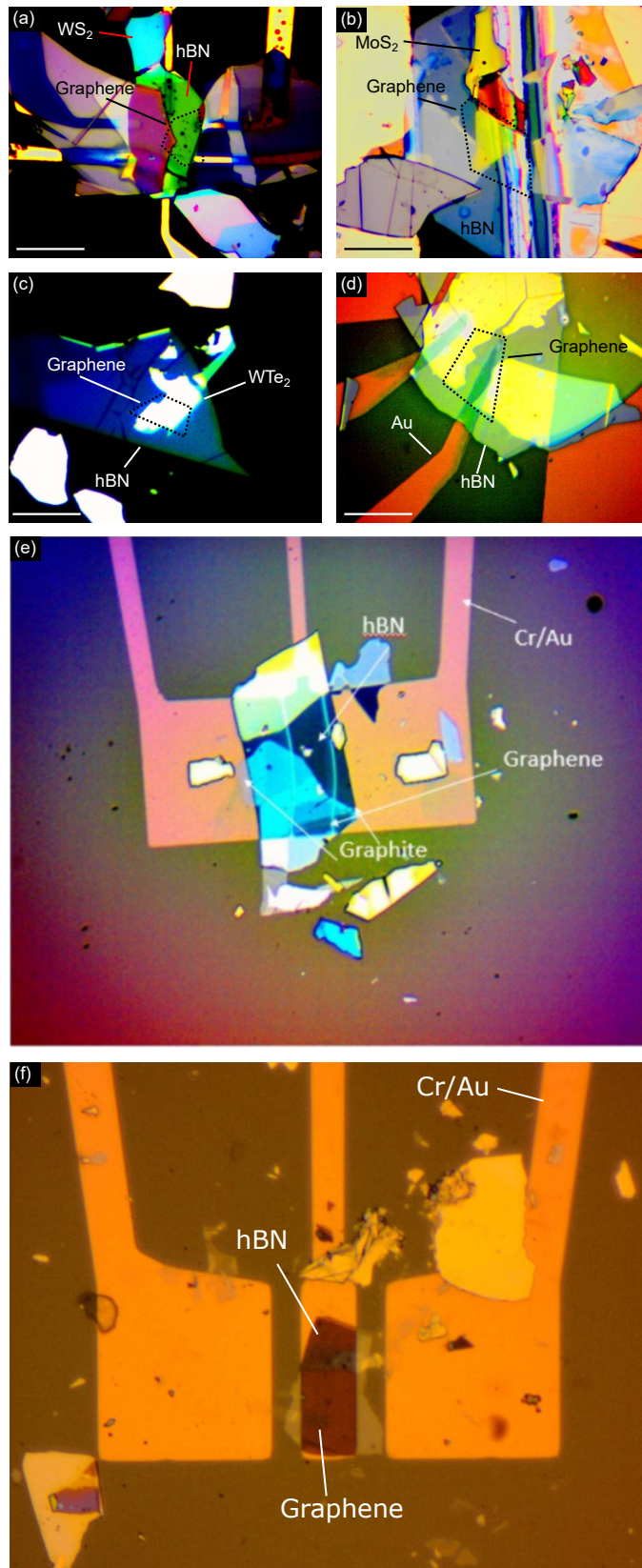


Fig. S 1. **Device Pictures.** Micrograph of the (a) WS₂, (b) MoS₂, (c) WTe₂, (d) Au₂, (e) Au₃, and (f) Au₄ devices.

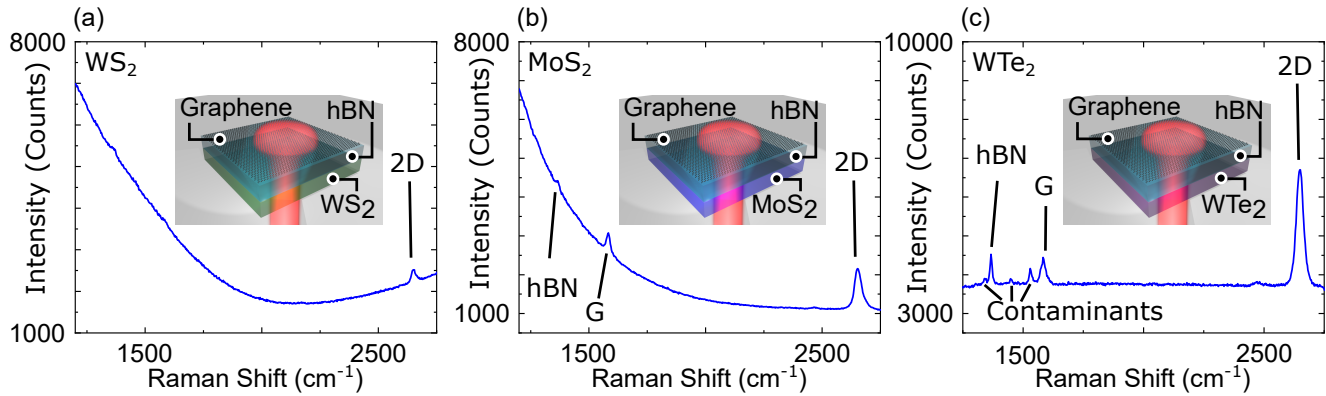


Fig. S 2. **Comparing the transparency of devices.** (a-d) Raman spectra of the WS_2 , MoS_2 , and WTe_2 heterostructures, respectively. The TMD's thickness is about 20-30 nm. The inset figures show sketches of the respective heterostructures. Panel (a) shows that WS_2 emit a significant photoluminescence tail at the graphene Raman peaks, where it obscures the G band observation. Although MoS_2 has some luminescence at graphene peaks, see panel (b), the G and 2D bands are clearly observed. In panel (c), data from FET with WTe_2 as a gate material is presented. There is no luminescence background, but data shows emissions from contaminants.

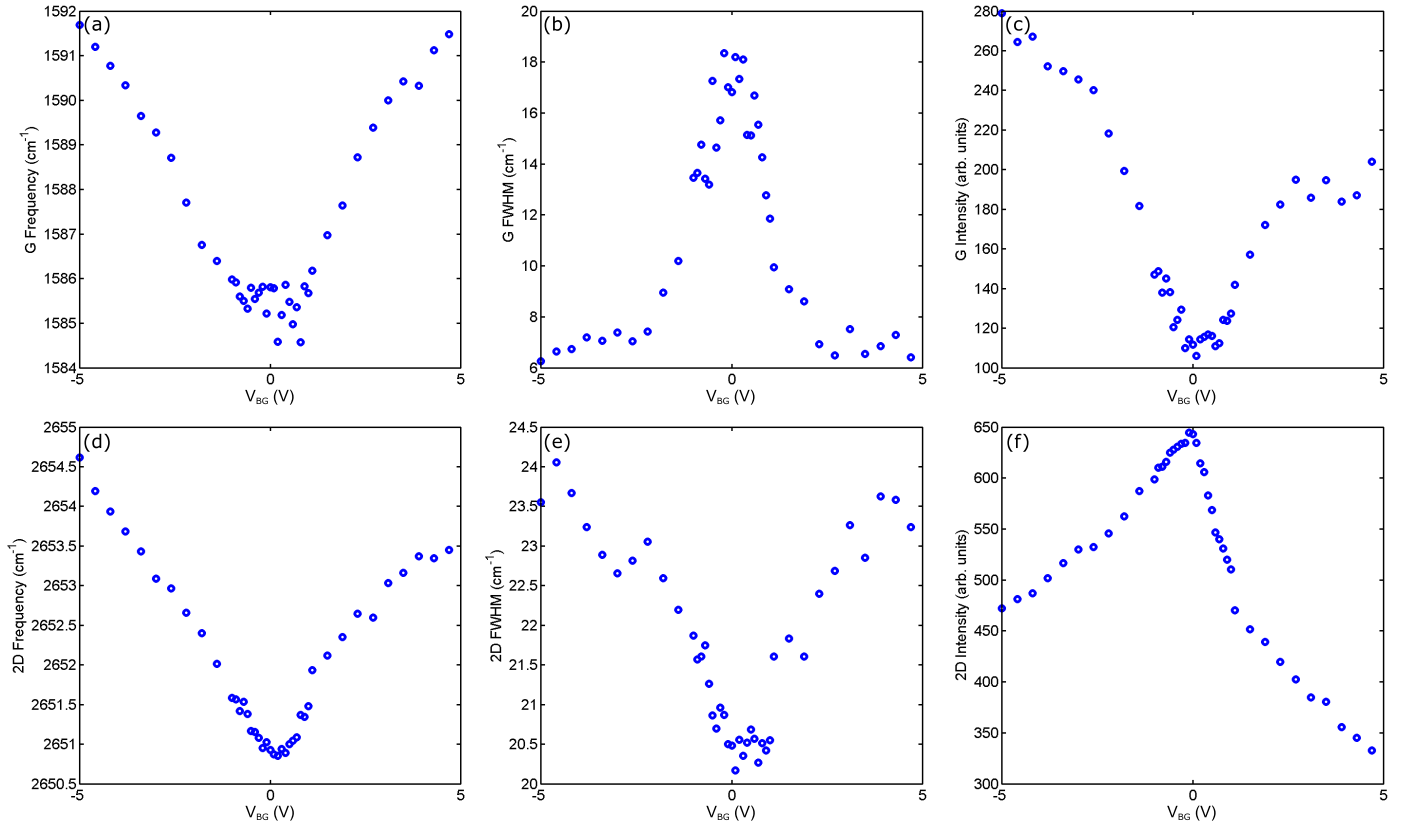


Fig. S 3. **Au1 Raman Characterization.** (a) G frequency, (b) G FWHM, (c) G intensity as a function of gate voltage for the Au1 device. (d) 2D frequency, (e) 2D FWHM, (f) 2D intensity as a function of gate voltage for the Au1 device.

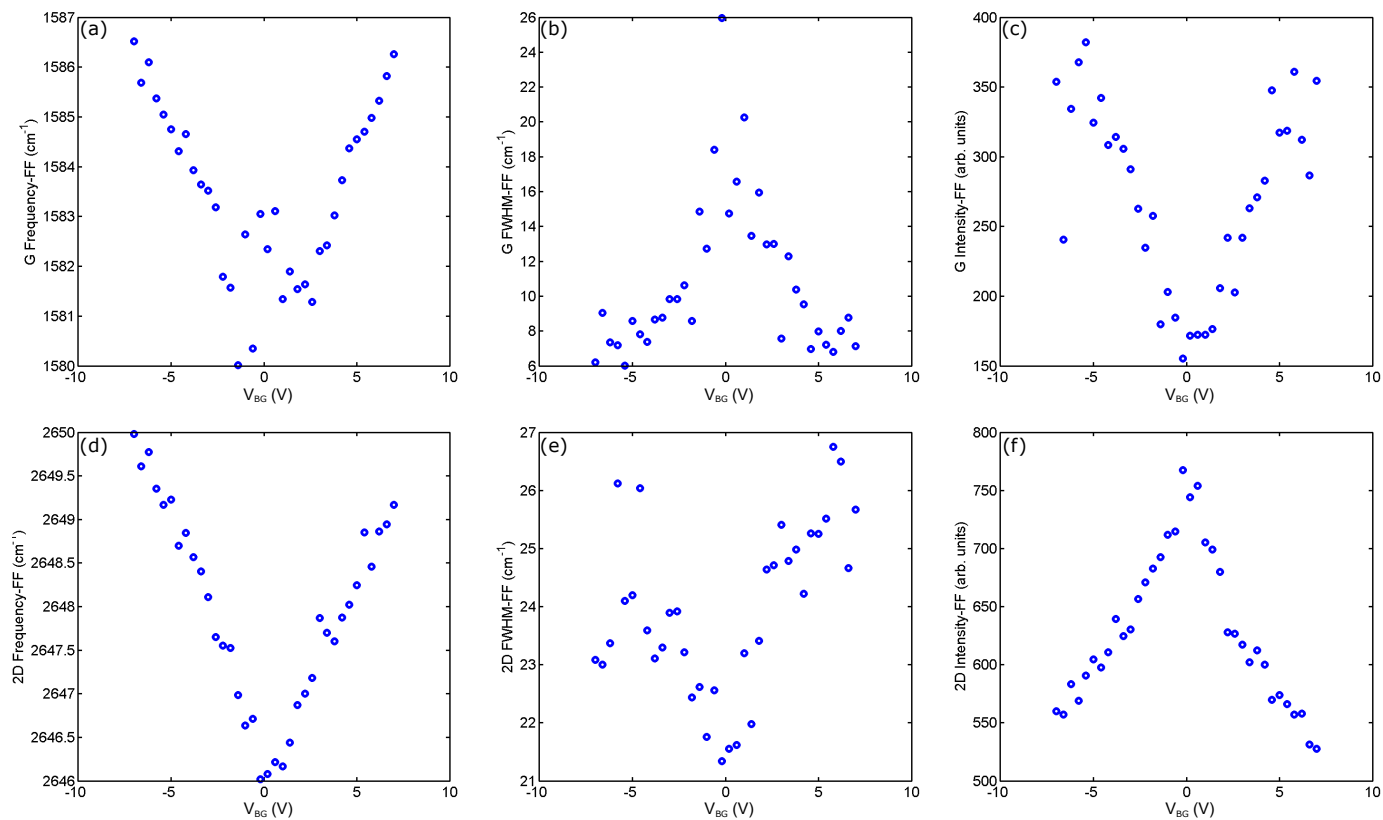


Fig. S 4. **Au3 Raman Characterization.** (a) G frequency, (b) G FWHM, (c) G intensity as a function of gate voltage for the Au3 device. (d) 2D frequency, (e) 2D FWHM, (f) 2D intensity as a function of gate voltage for the Au3 device.

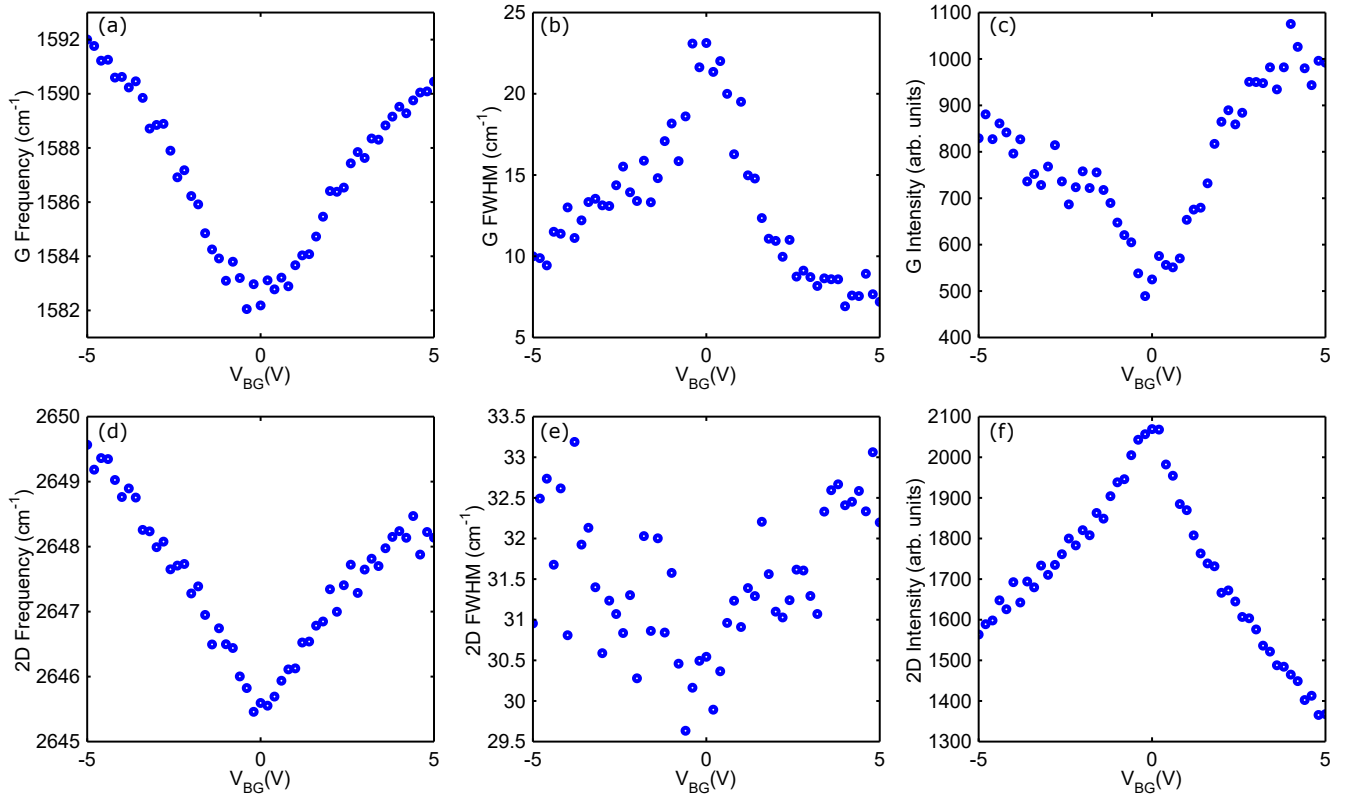


Fig. S 5. **Au4 Raman Characterization.** (a) G frequency, (b) G FWHM, (c) G intensity as a function of gate voltage for the Au4 device, first dataset. (d) 2D frequency, (e) 2D FWHM, (f) 2D intensity as a function of gate voltage for the Au4 device, first dataset.

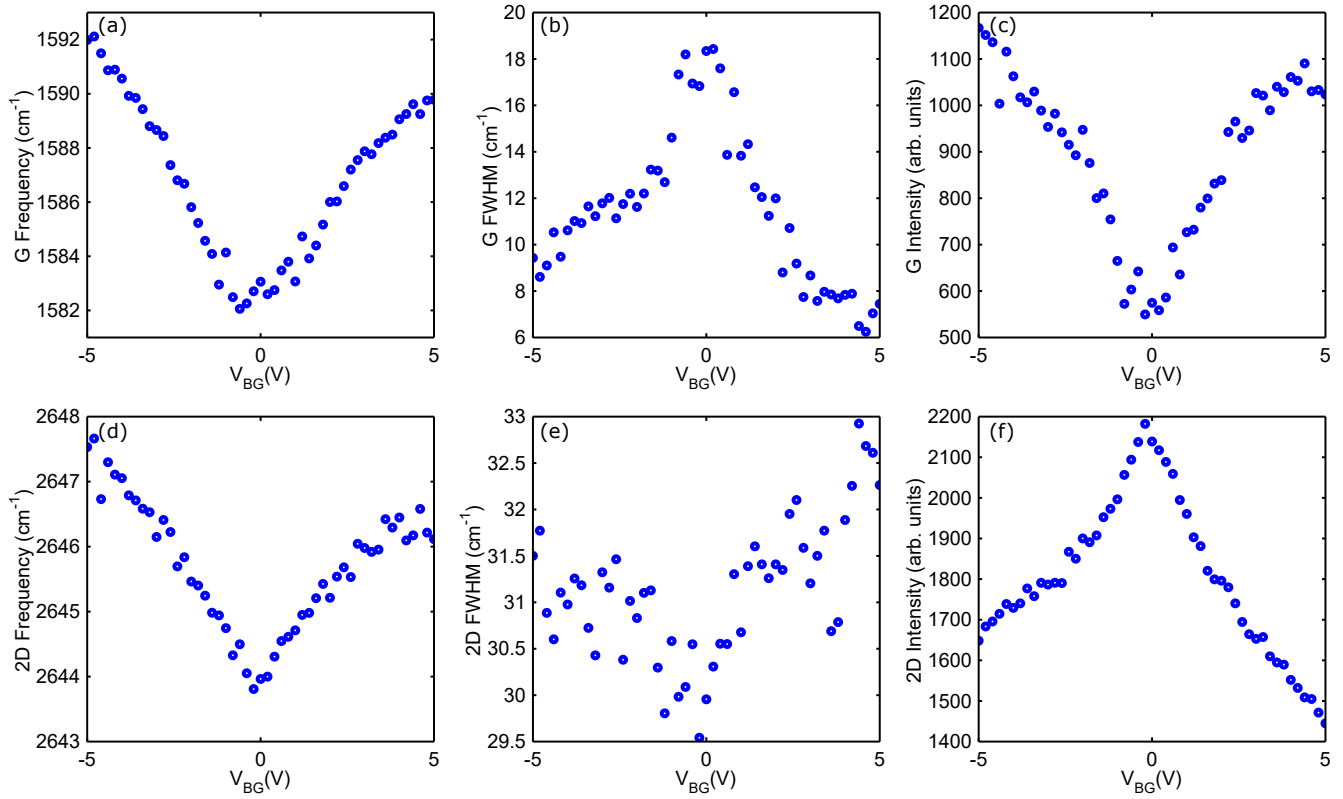


Fig. S 6. **Au4 Raman Characterization.** (a) G frequency, (b) G FWHM, (c) G intensity as a function of gate voltage for the Au4 device, second dataset. (d) 2D frequency, (e) 2D FWHM, (f) 2D intensity as a function of gate voltage for the Au4 device, second dataset.

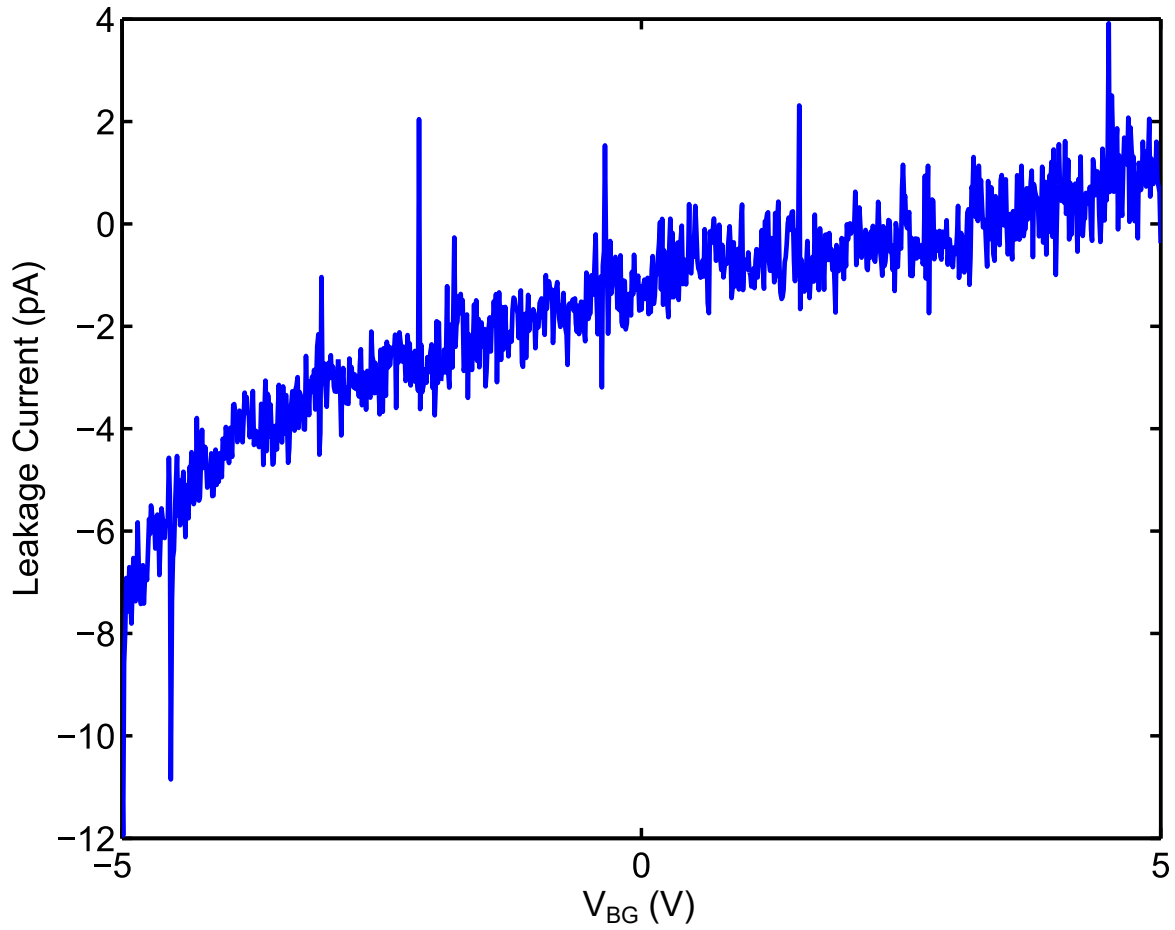


Fig. S 7. Leakage current of the Au1 device

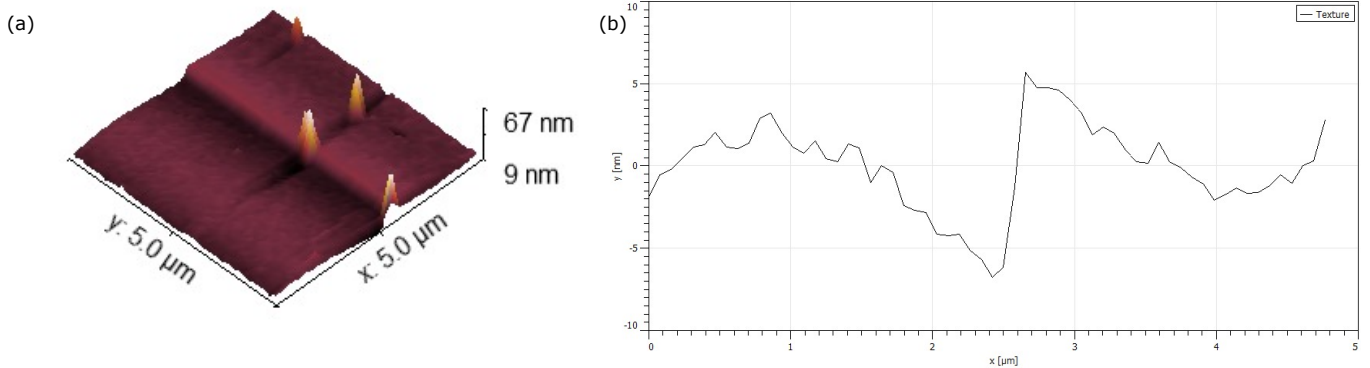


Fig. S 8. **AFM of the gold layer.** (a) AFM image of the gold layer from Au1 device and, (b) a line profile. These measurements show that although the Au layer is 10 nm, it is uniform.