

Supplementary Information:

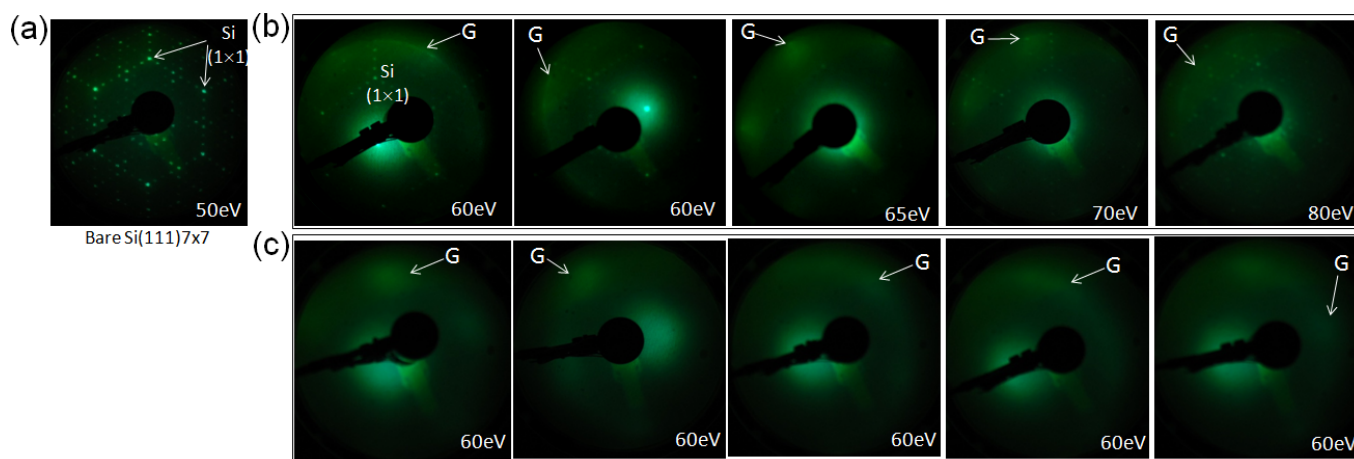
Semi-dry transfer of CVD graphene on Si: surface morphology and electronic properties

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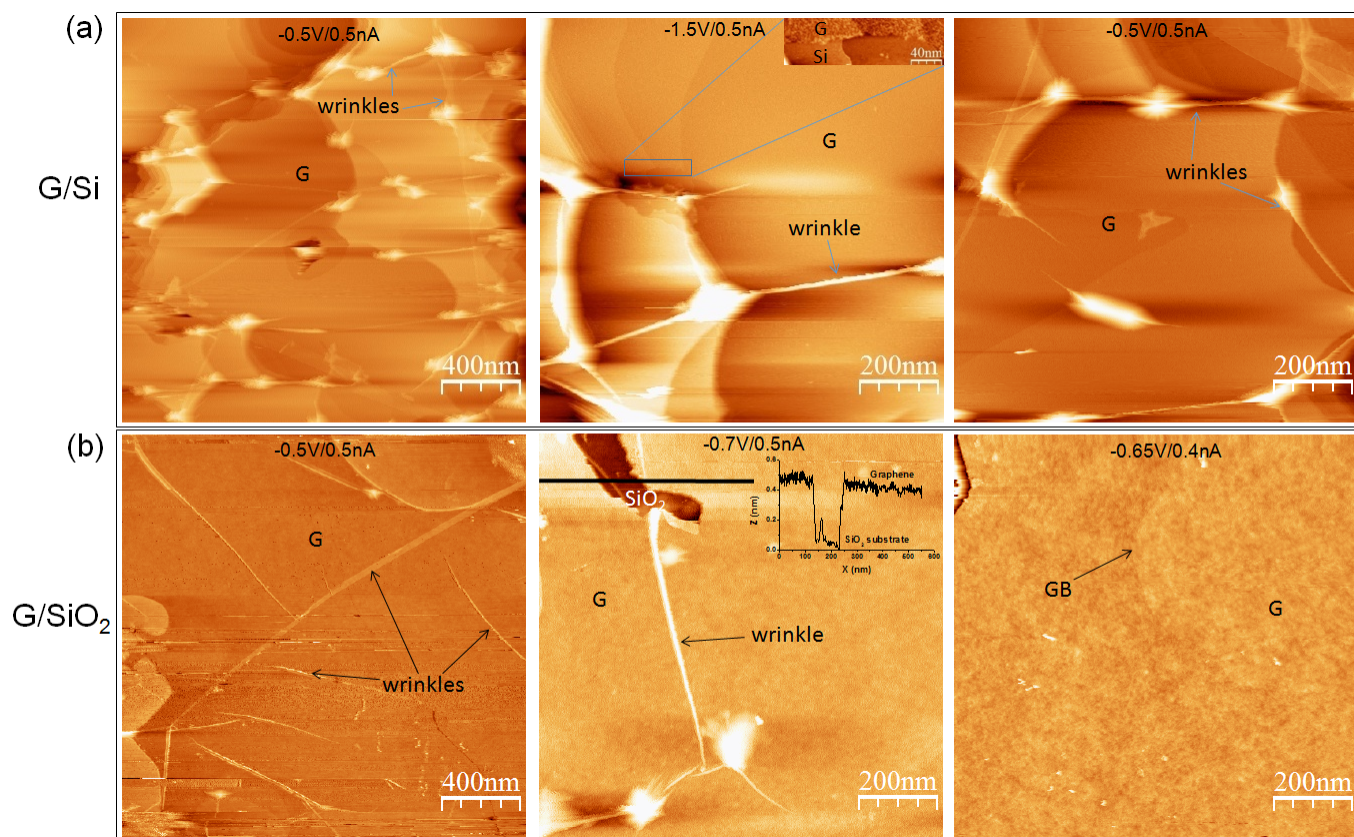
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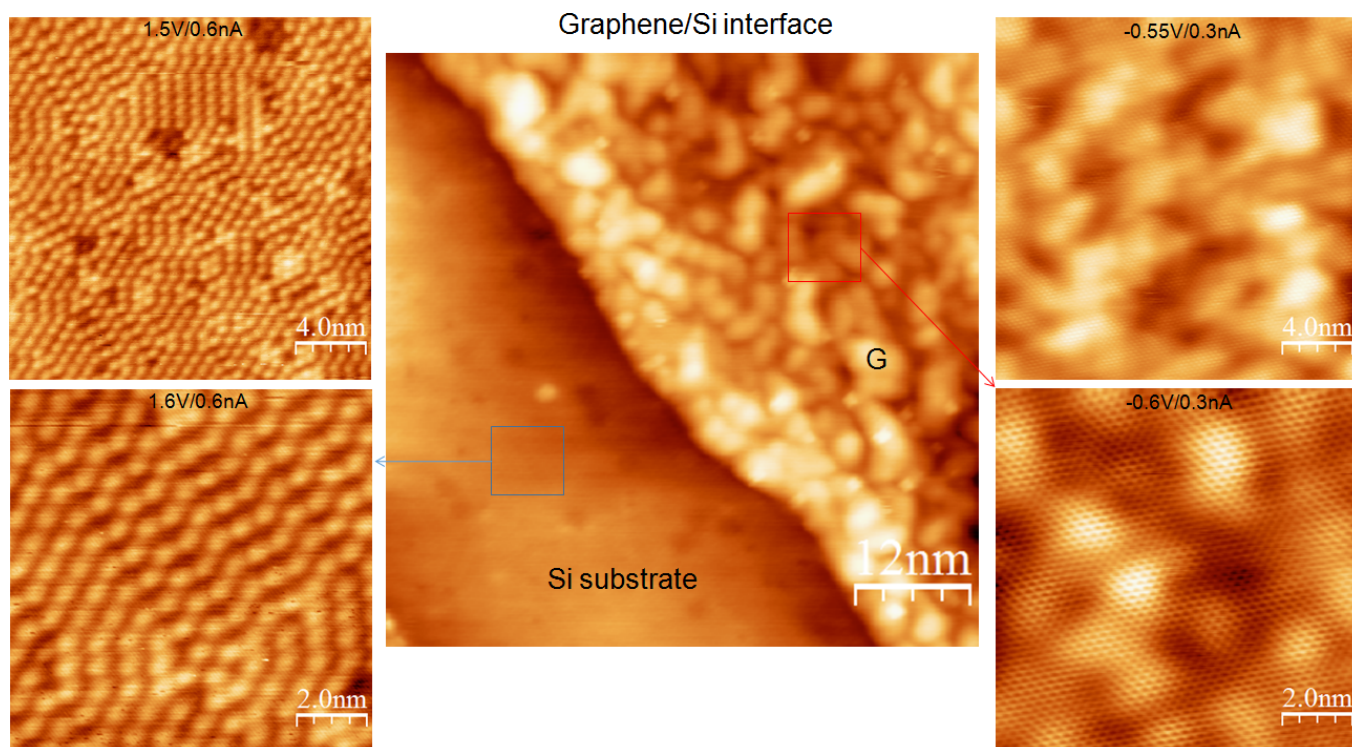


Supplementary Figure 1: LEED patterns of the Si(111) substrate and after the graphene transferred on its surface taken at different beam energies and on different positions: (a) Si(111) 7×7 surface reconstruction, (b) Graphene on 7×7 surface, and (c) Graphene on SiO₂/Si. G stands for graphene.

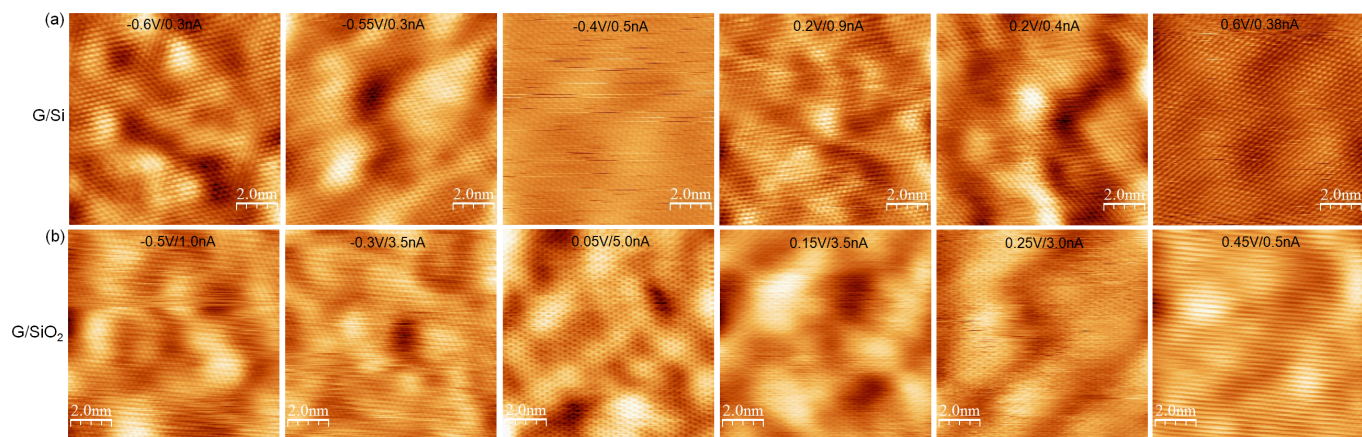
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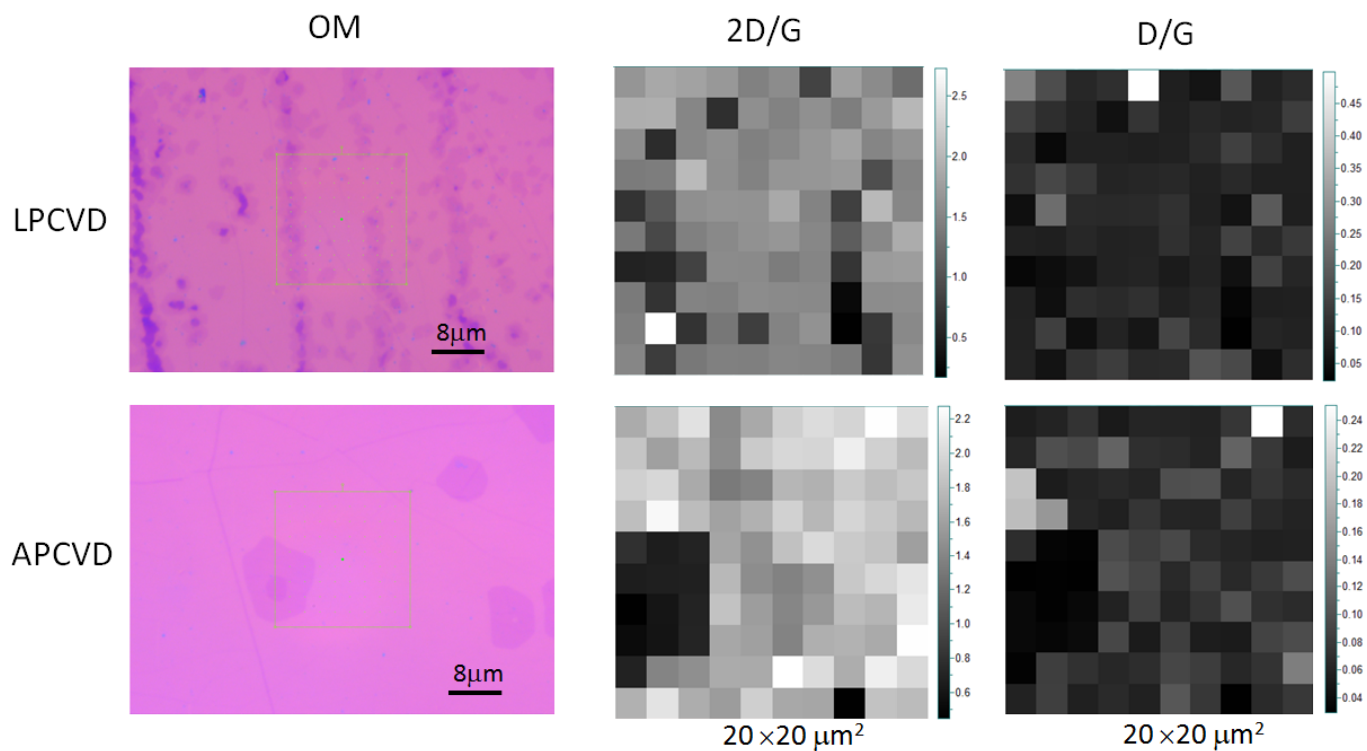
Supplementary Figure 2: Additional STM images taken at large scales on the different scanned areas for further confirmation of the nice transferred graphene on the Si substrates: (a) Graphene on Si(111), (b) Graphene on SiO₂/Si. G stands for graphene and GB stands for grain boundary.



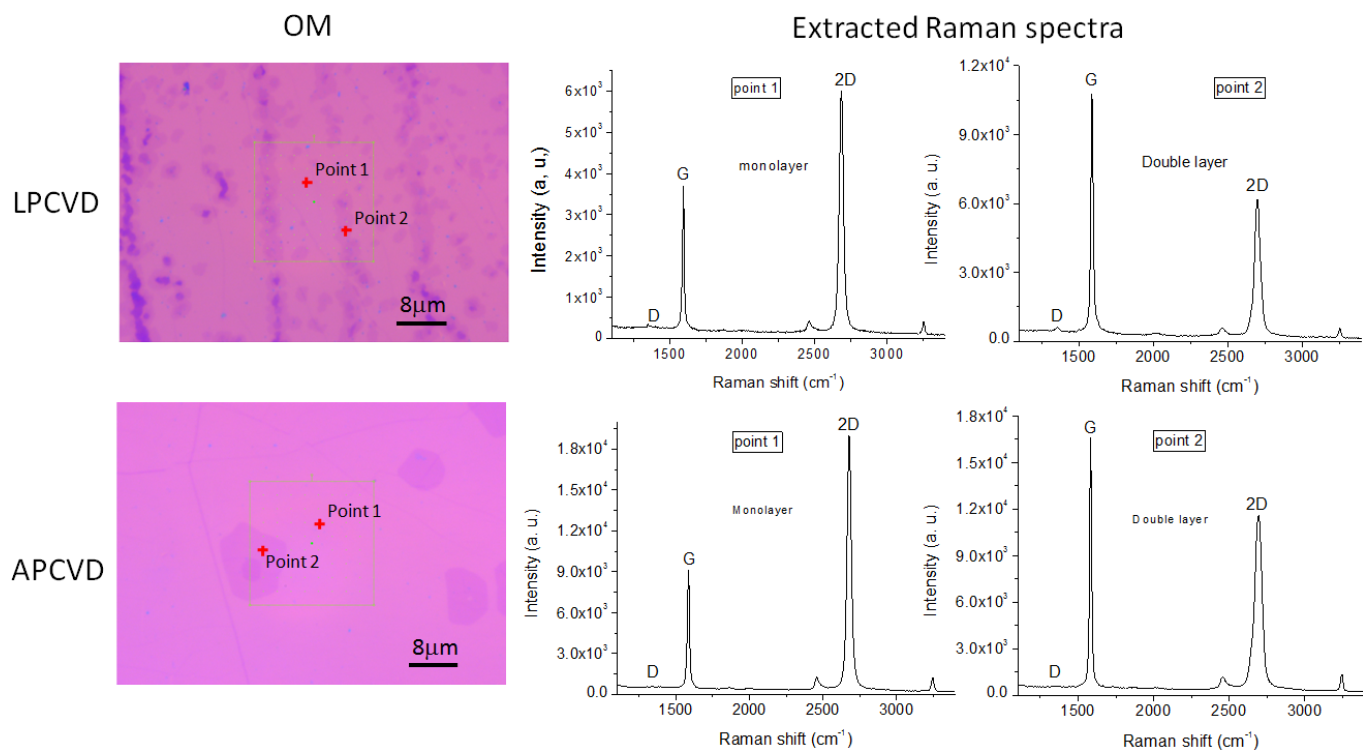
Supplementary Figure 3: Graphene/Si interface taken at the edge of the transferred graphene on Si(111) with the atomic resolution obtained on both Si substrate and graphene for comparison.



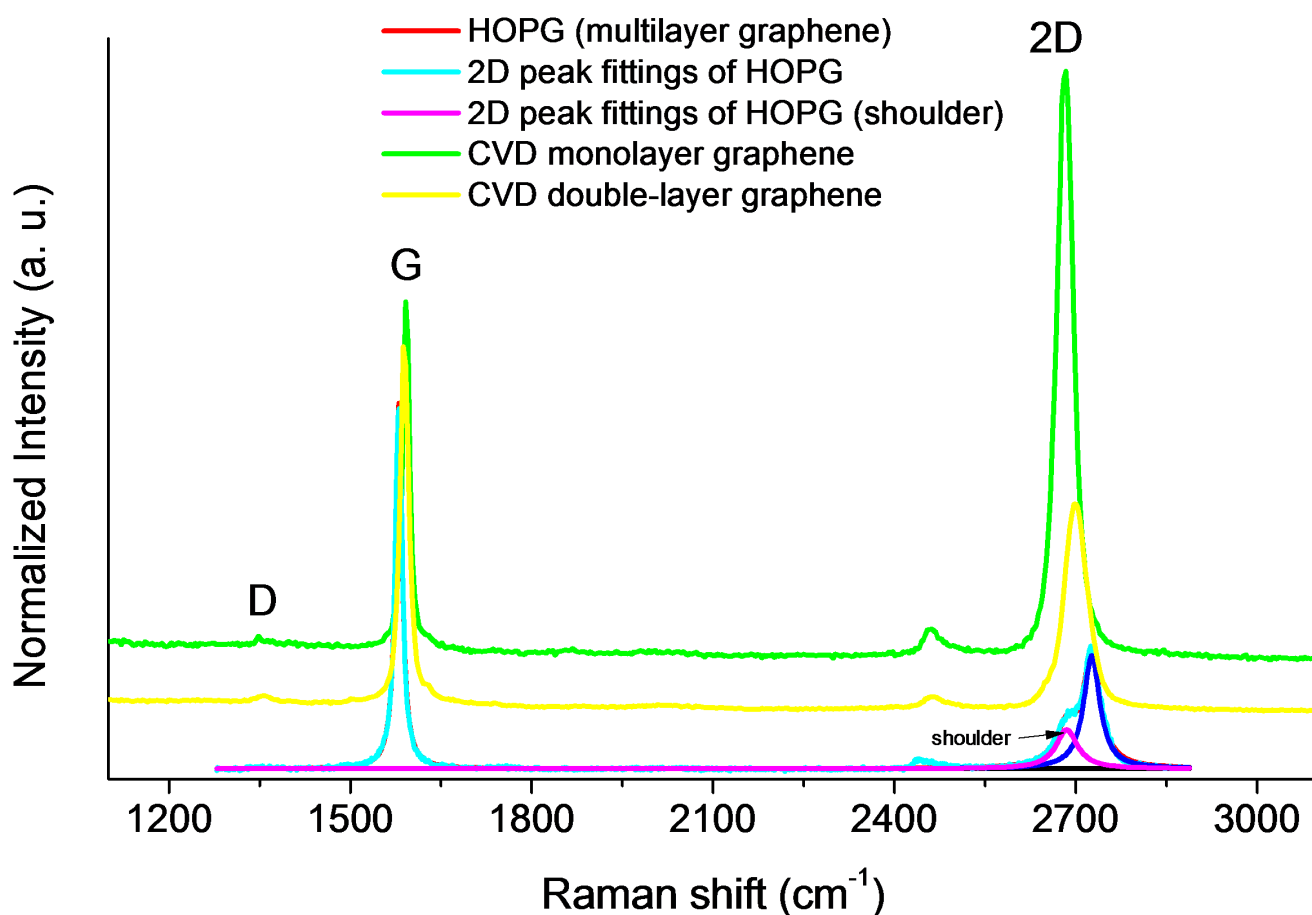
Supplementary Figure 4: Atomic resolution STM images taken at different sample biases: (a) Graphene on Si(111), and (b) Graphene on SiO₂/Si.



Supplementary Figure 5: The Raman map of both LPCVD and APCVD graphene: The optical images along with 2D/G and G/D maps showing the high crystalline quality of our graphene.



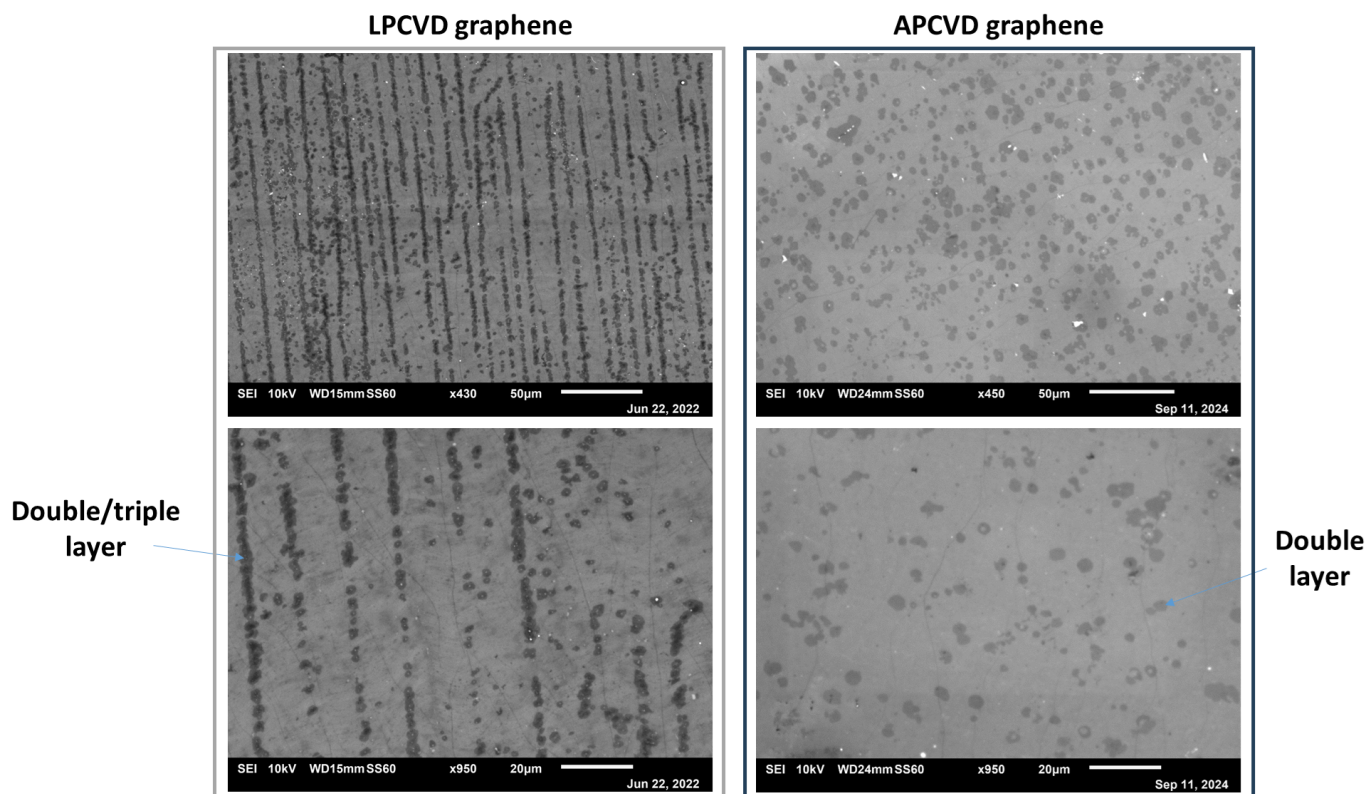
Supplementary Figure 6: The Raman spectra on the corresponding locations as extracted from the Raman map of LPCVD and APCVD.



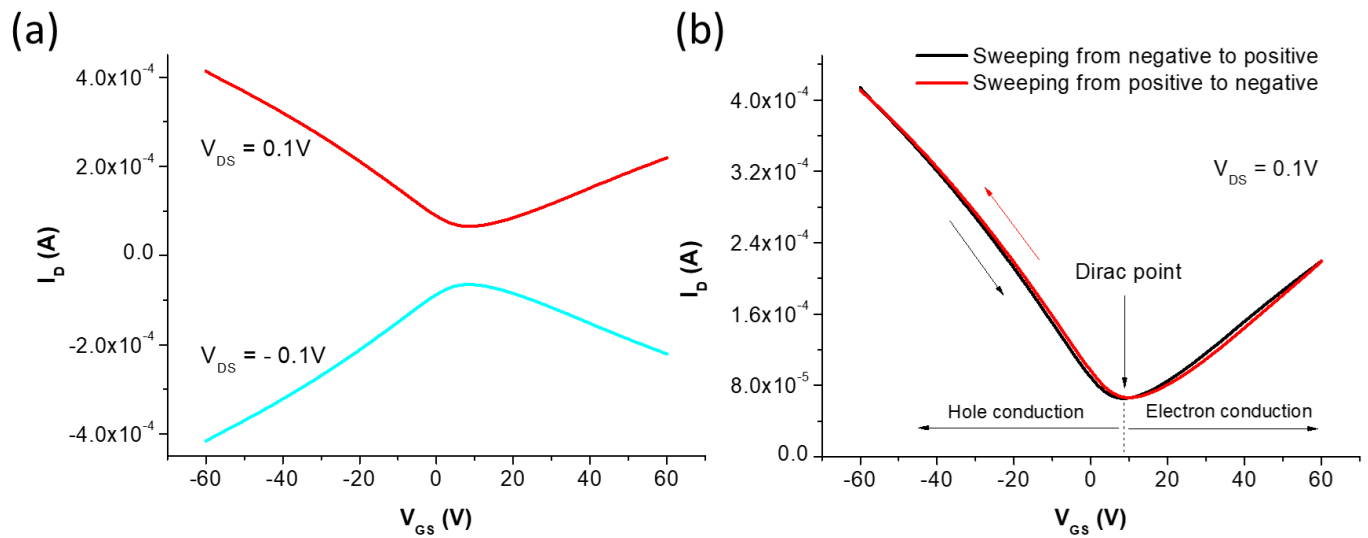
Supplementary Figure 7: The Raman analysis using peak fittings of HOPG showing 2D band with the main peak at $\sim 2725 \text{ cm}^{-1}$ and its shoulder at $\sim 2684 \text{ cm}^{-1}$ compared with that of mono-/double-layer graphene.

From the Raman spectrum of HOPG (multilayer graphene), it can be seen that the 2D peak contains the main peak at 2725 cm^{-1} and a shoulder at 2684 cm^{-1} while the G peak is located at 1580 cm^{-1} . By peak fittings, our graphene exhibits the characteristics of monolayer graphene with a much higher peak intensity than the shoulder of HOPG at 2684 cm^{-1} . More details can be found in the following Table.

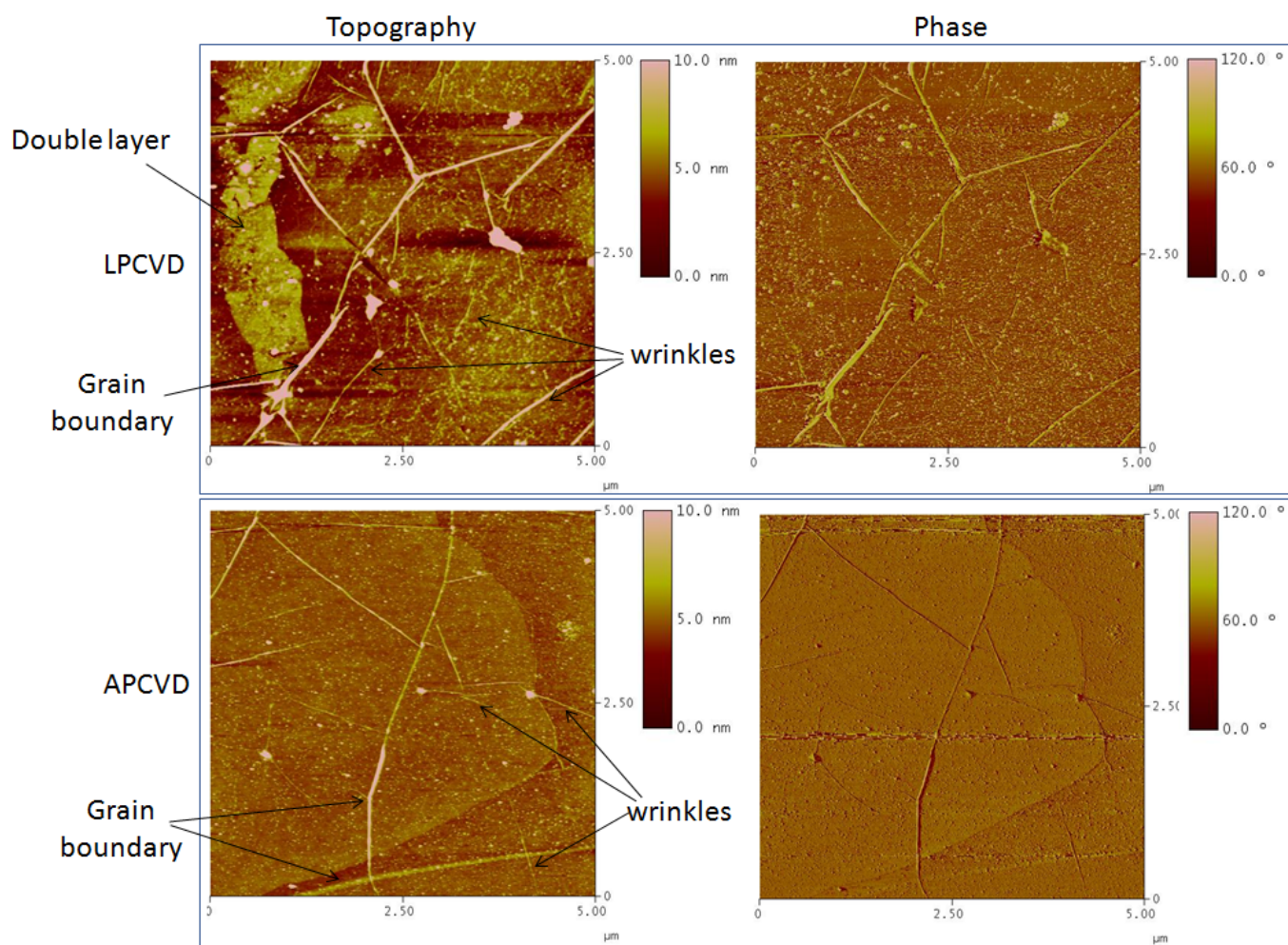
Sample		G position	2D position		$I_{2D/G}$ peak ratio
HOPG		1580 cm^{-1}	Main peak	shoulder	0.3 (taken shoulder)
			2725 cm^{-1}	2684 cm^{-1}	
Graphene	monolayer	1591 cm^{-1}	2684 cm^{-1}		~ 2
	doublelayer	1588 cm^{-1}	2697 cm^{-1}		~ 1



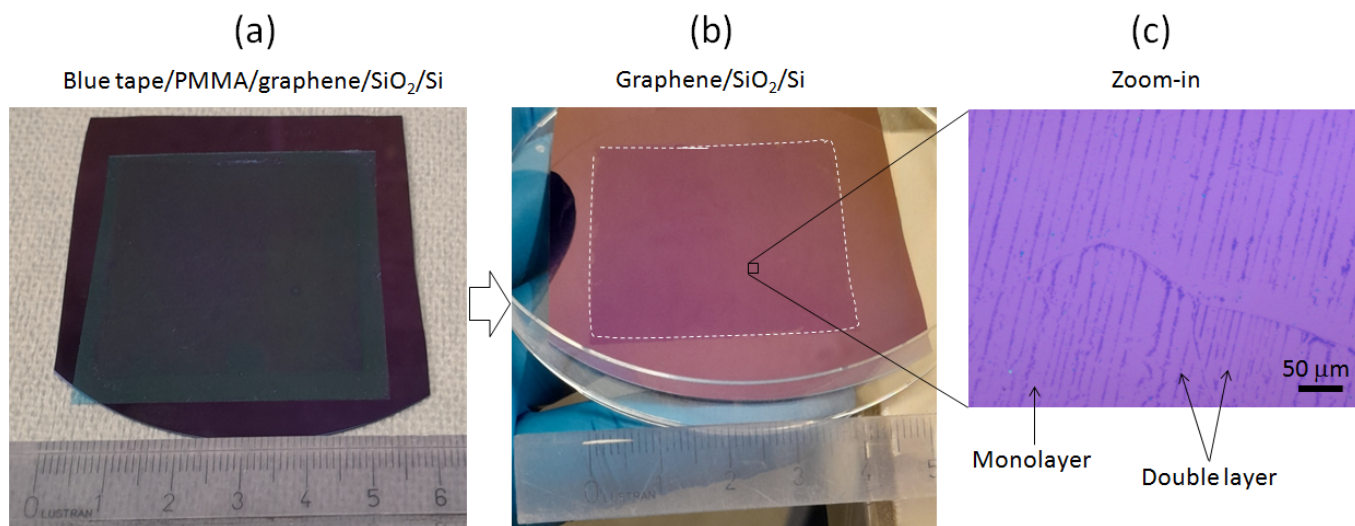
Supplementary Figure 8: SEM images of (a) LPCVD and (b) APCVD graphene transferred on SiO_2/Si for comparison.



Supplementary Figure 9: The I-V curves of APCVD based GFET: (a) I_D versus V_{GS} characteristics of the device for V_{DS} polarity change; (b) Variation of I_D for both forward and reverse sweep of V_{GS} at $V_{DS} = 0.1V$.



Supplementary Figure 10: The AFM images of our graphene FETs channel using LPCVD and APCVD graphene.



Supplementary Figure 11: (a) Blue tape/PMMA/graphene/SiO₂/Si substrate. (b) Graphene/SiO₂/Si after removing blue tape. (c) Zoom-in optical image taken at smaller scale.