Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information

Distinct antibacterial activity of vertically aligned graphene coating against Gram-positive and Gram-negative bacteria

Wei Wei, Jiurong Li, Zeyang Liu, Yuan Deng, Da Chen, Ping Gu, Gang Wang*, Xianqun Fan**

Additional results and discussion.

Characterisation of isomerism structured graphene coatings.

The synthesis processes were performed via plasma-enhanced chemical vapour deposition (PECVD) and chemical vapour deposition (CVD) using methane (CH_4) as the carbon source with graphene materials being synthesised on Si and SiO_2 substrates. The specific experimental process is shown in Fig. S1 and S2. Raman spectra of the graphene materials are illustrated in Fig. S3: there are three primary peaks: a D-band, a G-band, and a 2D-band at *c*. 1350, *c*. 1580, and *c*. 2700 cm^{-1}, respectively, however, compared to horizontal graphene, vertical graphene contained a large defect-related D-peak that emerged at approximately 1350 cm^{-1}, indicating the presence of defects in these graphene sheets. For horizontal graphene, the calculated peak intensity ratio of the 2D-band to the G-band (I_{2D}/I_G) ratios exceeded 1.5, indicating the formation of only monolayer graphene films. Noticeably, for vertical graphene, the peak intensity ratio of the D-band to the G-band (I_D/I_G) is much larger than that of planar graphene. Fig. S4 and S5 in the Supporting Information provide more details of the Raman scattering analysis of films of doped graphene. To study the morphology of graphene grown on Si and SiO_2 substrates, AFM images of graphene films are shown in Fig. S6. The corresponding height curve is shown in the upper right corner of the AFM image and corresponds to the white line in Fig. S6. Fig. S7 shows the water contact angle (CA) of the graphene material surfaces in an ambient environment with respect to their different morphologies. The CA measurement shows that, depending on the morphology, the hydrophilic surface had a contact angle of 85° to 87° for horizontal graphene, but the vertical graphene was transformed into a near-superhydrophobic surface with a contact angle of 138° to 140°.

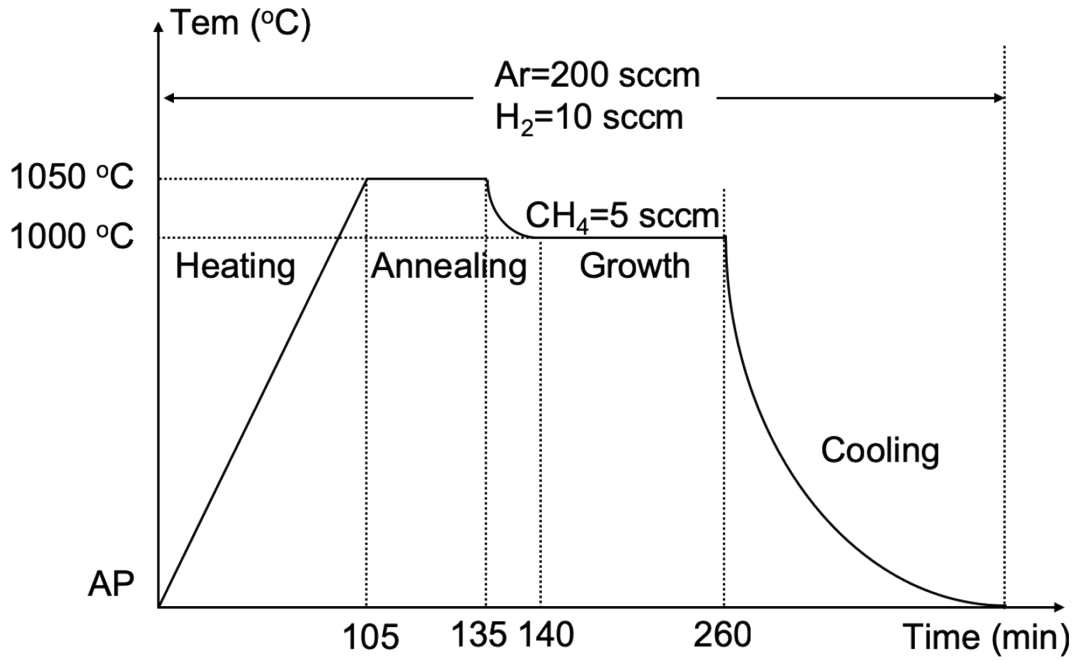

Fig. S1 Experimental thermal process schematic illustrates the growth of the horizontally aligned graphene films.

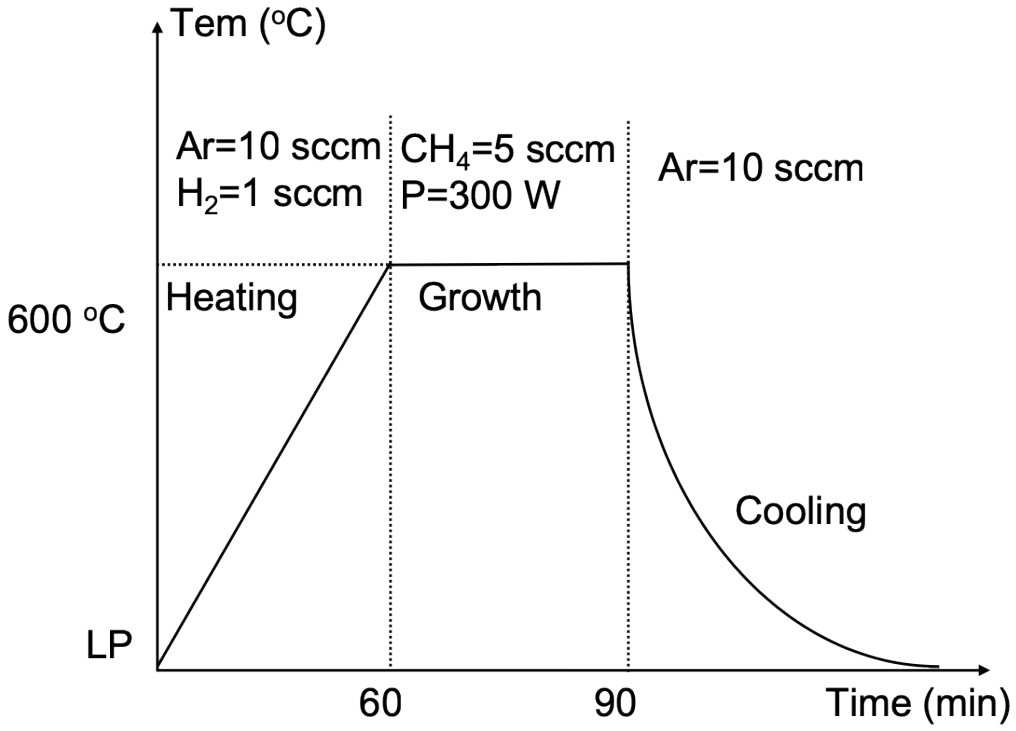

Fig. S2 Experimental thermal process schematic demonstrates the growth of the vertically aligned graphene sheets.

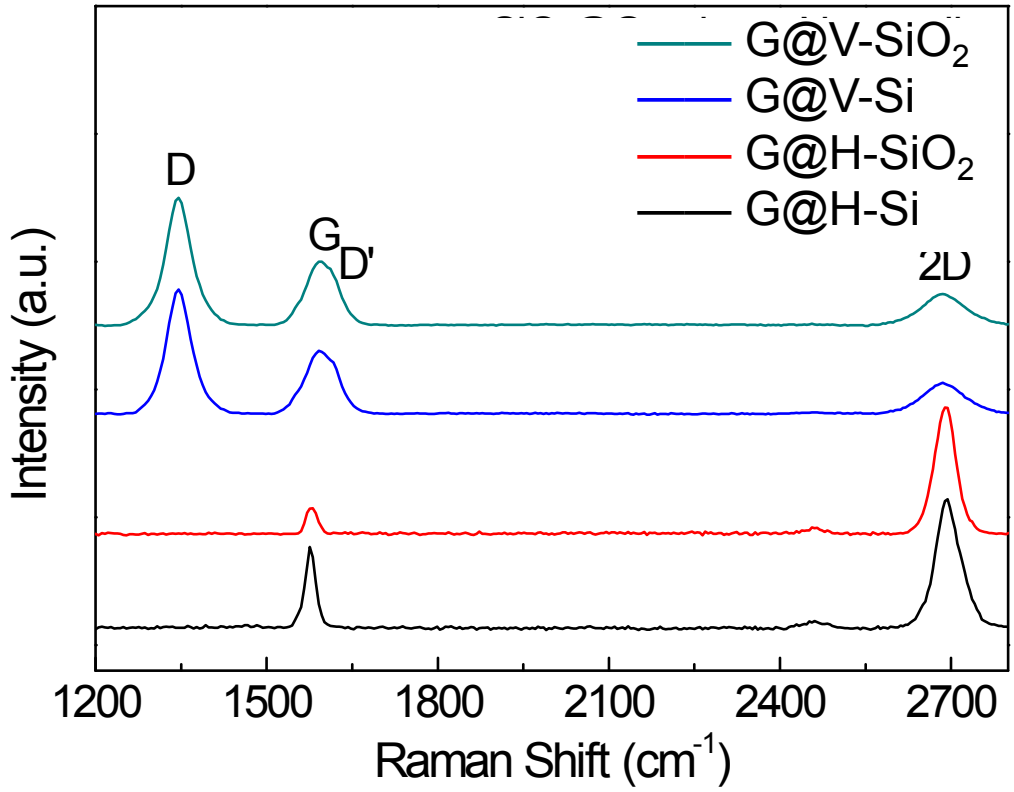

Fig. S3 Raman spectroscopy of graphene materials.

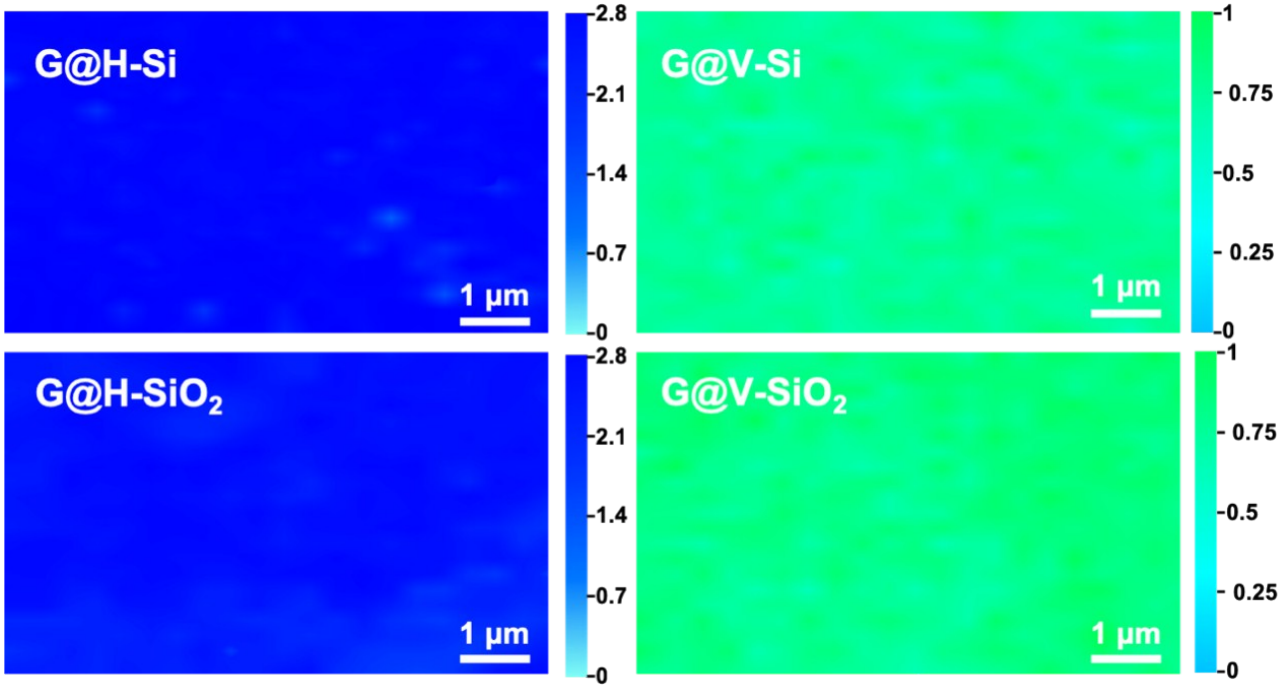

Fig. S4 The I_{2D}/I_G peak ratio derived from Raman mapping over an area measuring 1 cm × 1 cm on the graphene coatings.

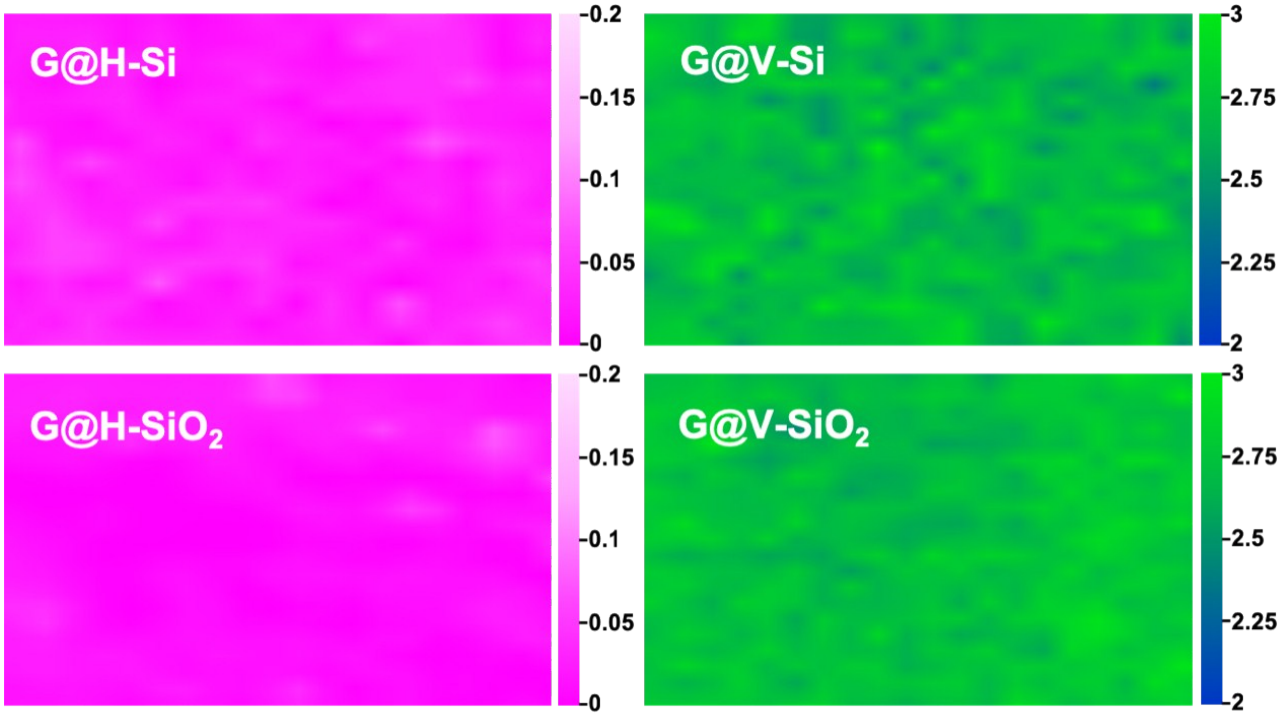

Fig. S5 The I_D/I_G peak ratio derived from Raman mapping over an area measuring 1 cm × 1 cm on the graphene coatings.

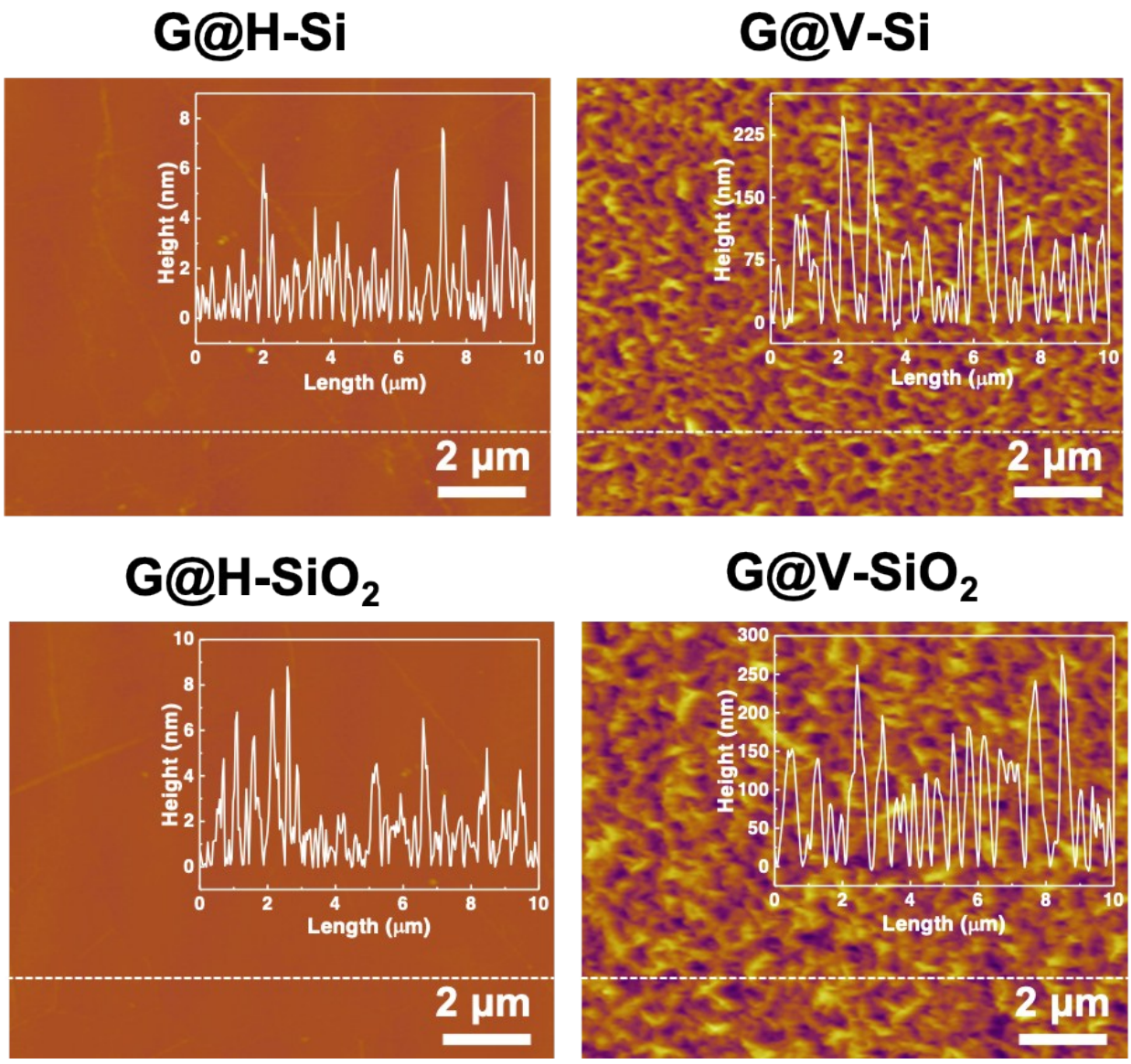

Fig. S6 Contact-mode AFM image of the graphene grown on the Si and SiO_2 substrates. The inset shows the height of the graphene materials.

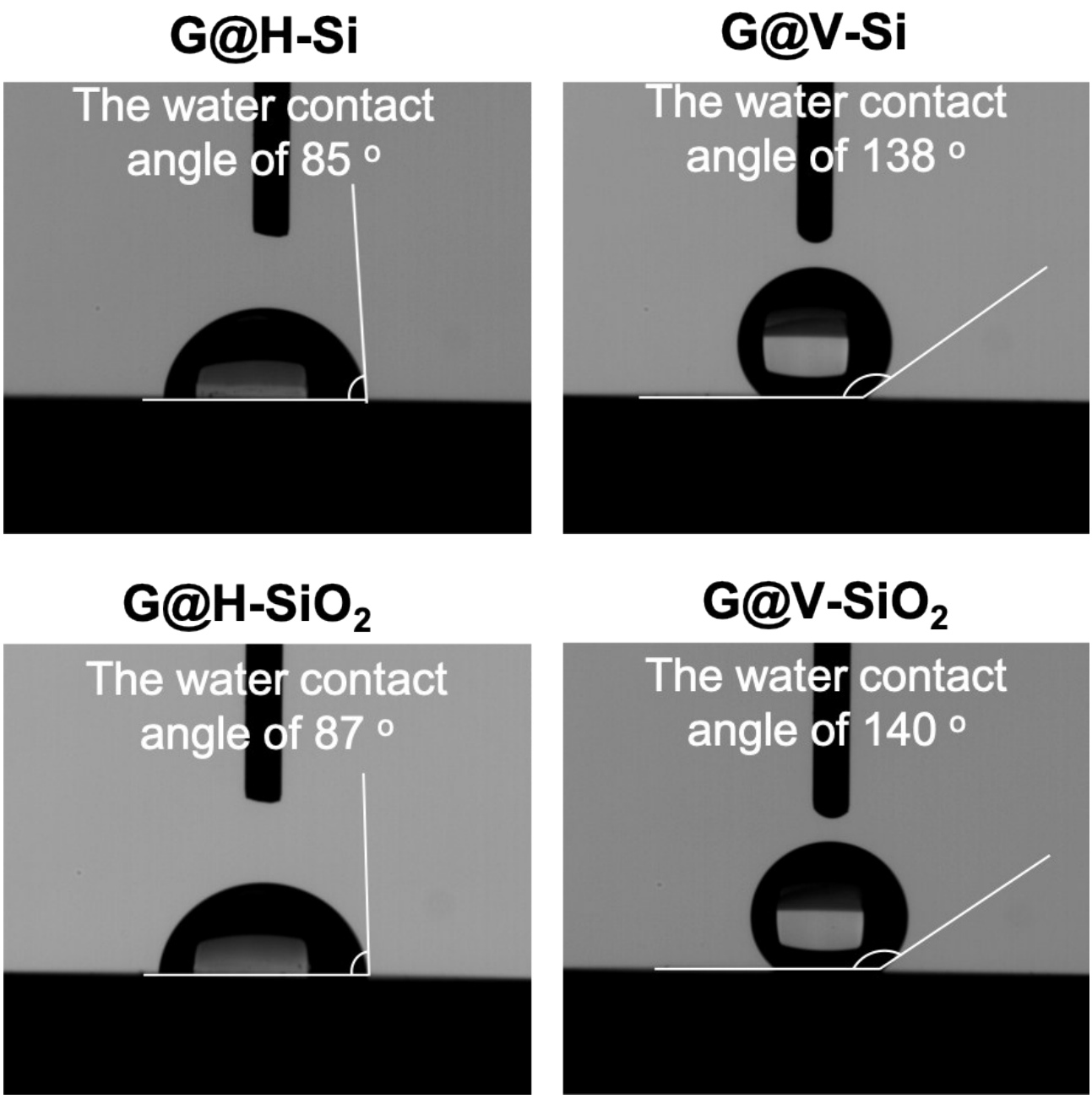

Fig. S7 The water contact angle of graphene grown on the Si and SiO_2 substrates.