Supporting Information

Smoothening of wrinkles in CVD-grown hexagonal boron nitride films

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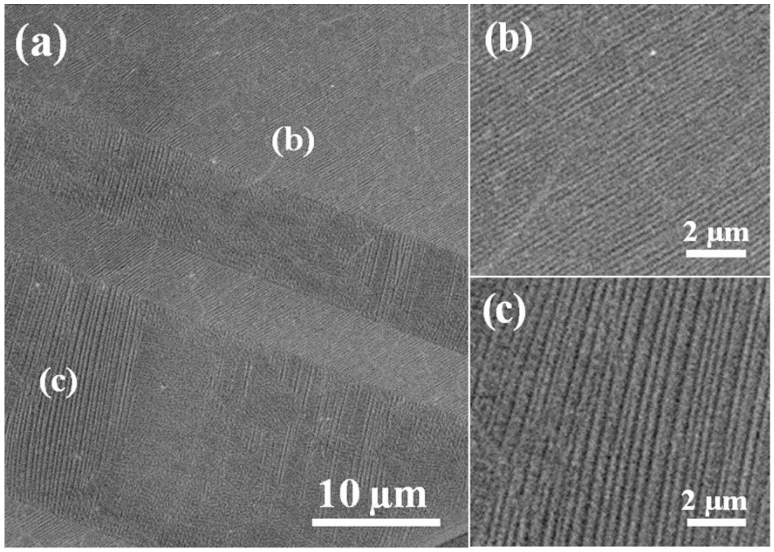


Fig. S1 (a) SEM image of as-grown h-BN film on Cu. (b,c) Magnified SEM images in (a) showing the different orientation of the step bunches on different Cu grains.

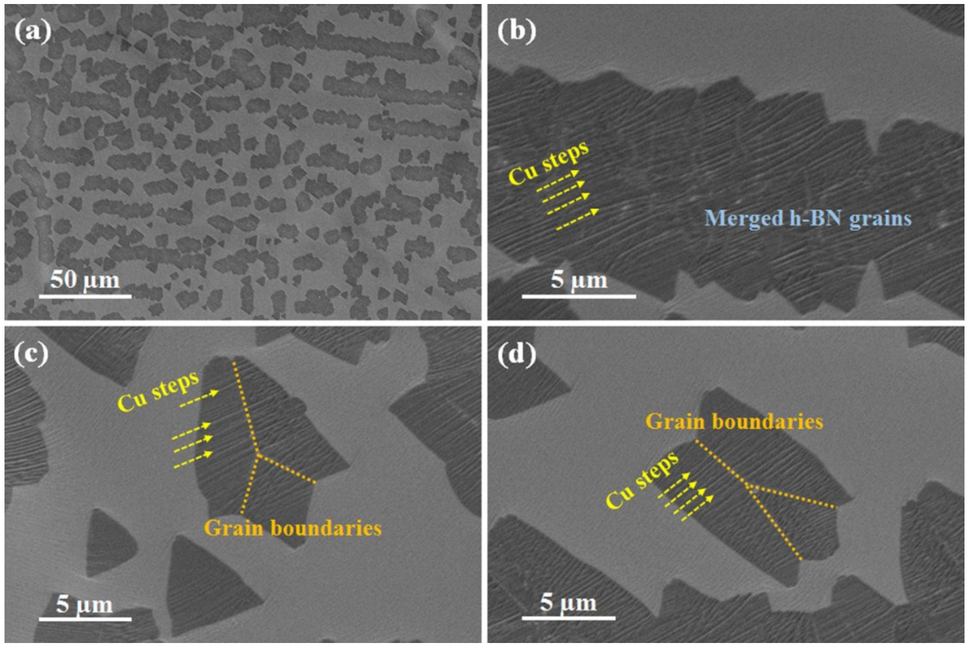


Fig. S2 (a) SEM image of a partially continuous monolayer h-BN film. (b–d) Magnified SEM images revealing the Cu corrugation across multiple h-BN grain boundaries.

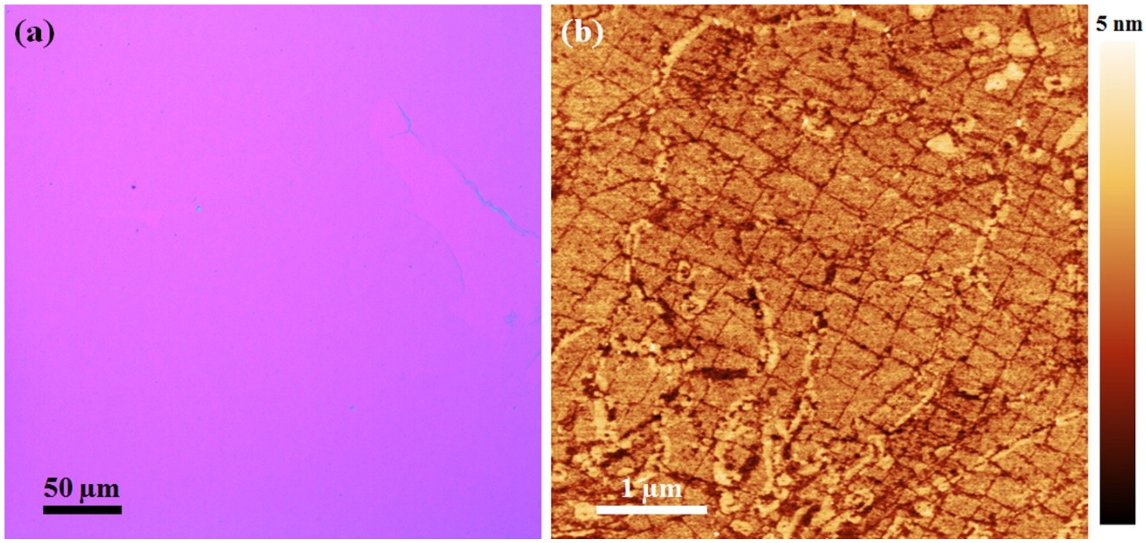
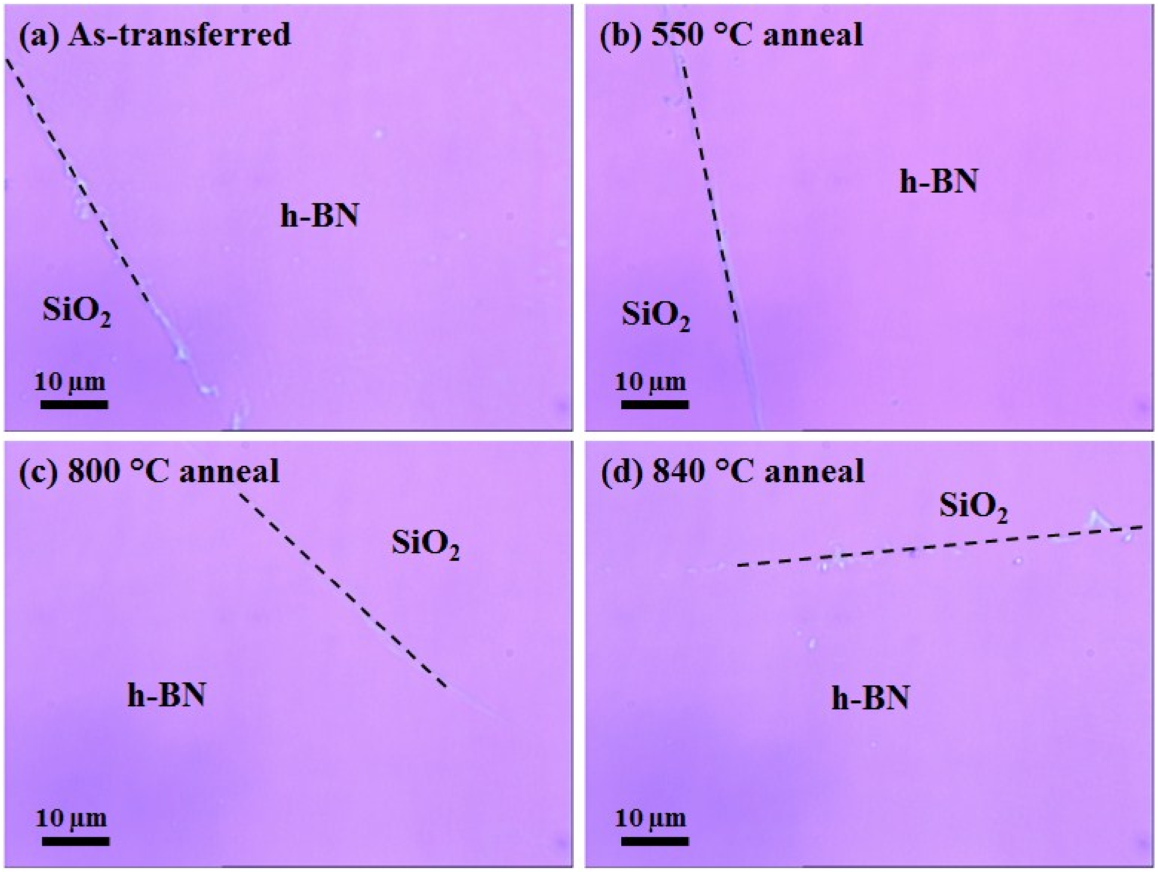
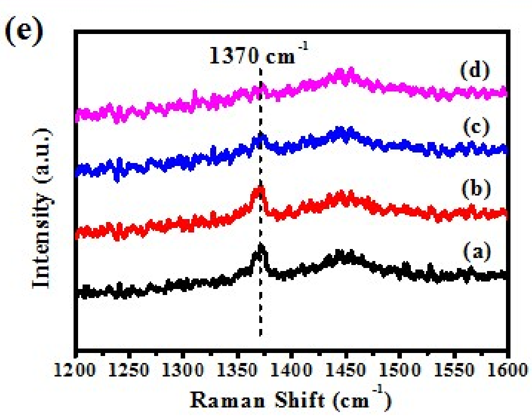


Fig. S3 (a) Optical and (b) AFM images of transferred h-BN film after annealing at 840 °C for 2 h. The onset of oxidation can be observed by the presences of nanoscale pits and the elongated etch lines along the wrinkled structures.[1]





(f)

h-BN	Peak position (cm^{-1})	FHWM (cm^{-1})
(a)	1370.30	12.00
(b)	1369.33	12.01
(c)	1370.10	19.71

Fig. S4 Optical images of (a) as-transferred h-BN film on SiO_2/Si substrate and after annealing in air at (b) 550 °C, (c) 800 °C and (d) 840 °C. (e,f) Raman spectra and their corresponding fitted peaks of the respective h-BN films in (a – d).

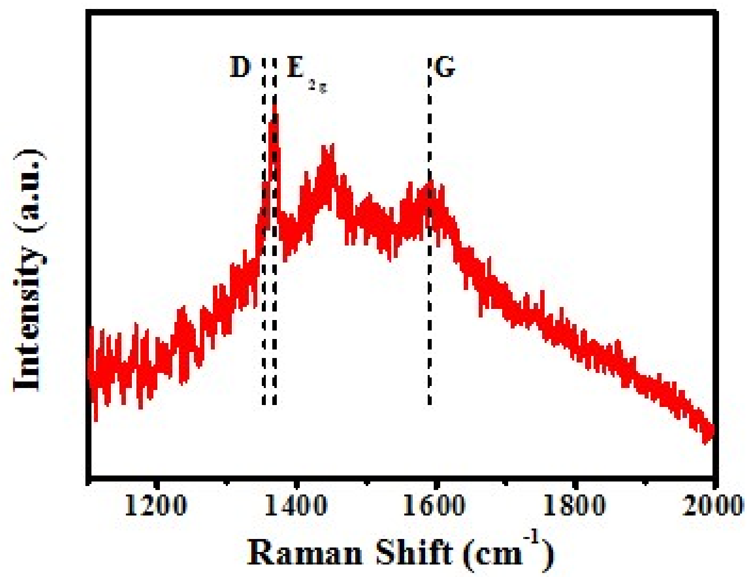


Fig. S5 Representative Raman spectrum in some regions of the annealed h-BN film with multilayers indicating the presence of carbonaceous contamination by the presence of D and G bands.

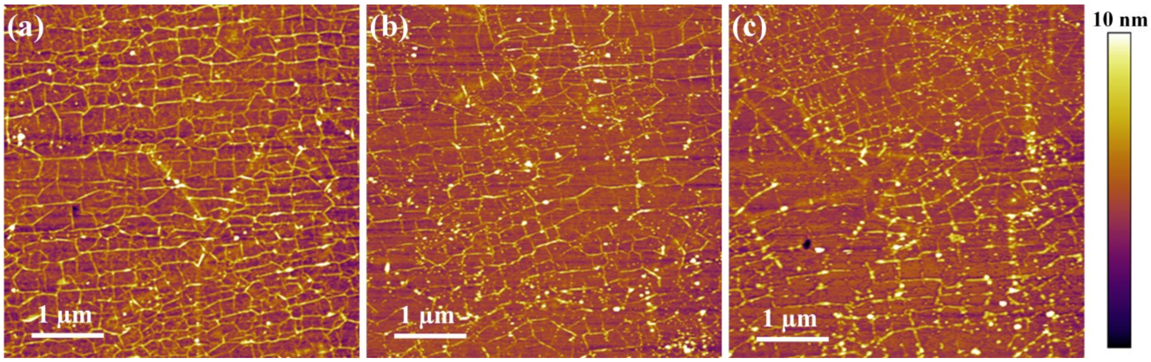


Fig. S6 AFM images of (a) as-transferred h-BN film and after annealing at 550 °C under 200:20 sccm of Ar/H_2 for (b) 10 min and (c) 1 h. The h-BN wrinkles are still prevalent even after 1 h of annealing in Ar and H_2.

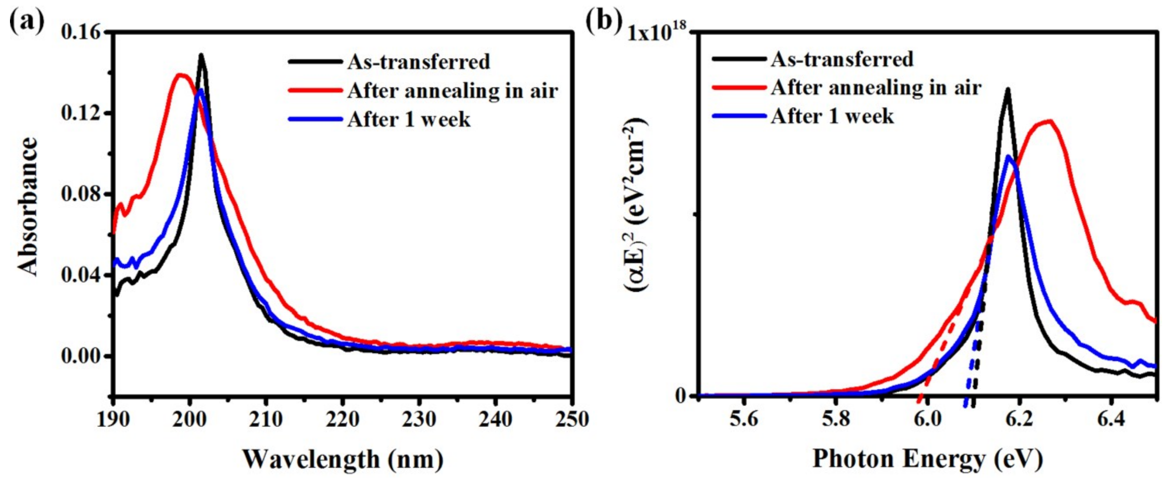


Fig. S7 (a) UV-vis absorbance spectra and its corresponding (b) Tauc's plot of an as-transferred monolayer h-BN film (black trace), after annealing in air at 550 ºC for 10 min (red trace) and after another week of inactivity (blue trace), on quartz substrate.

To convert the absorbance spectra into Tauc's plots for bandgap extraction, we use the derived formula for a direct band gap semiconductor,[2]

$$\alpha = C(E - E_g)^{1/2}/E \qquad (1)$$

Where α is the absorption coefficient, C is a constant and E is the photon energy. α is calculated by the measured optical absorption divided by the film thickness. By plotting $(\alpha E)^2$ against E, a straight line can be extrapolated from the energy dispersion curves and their bandgaps, E_g, can be extracted at the intersection of the extrapolated lines and the x-axis.

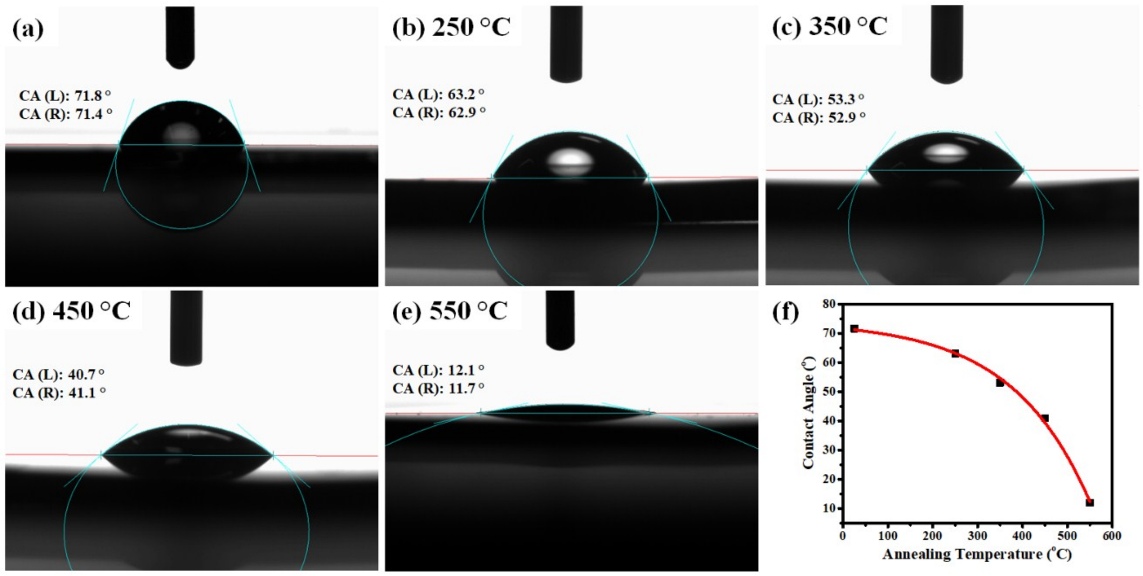


Fig. S8 CA of DI water droplets on SiO_2/Si substrate (a) before and after annealing in air for 10 min at (b) 250 ºC, (c) 350 ºC, (d) 450 ºC, (e) 550 ºC, respectively.

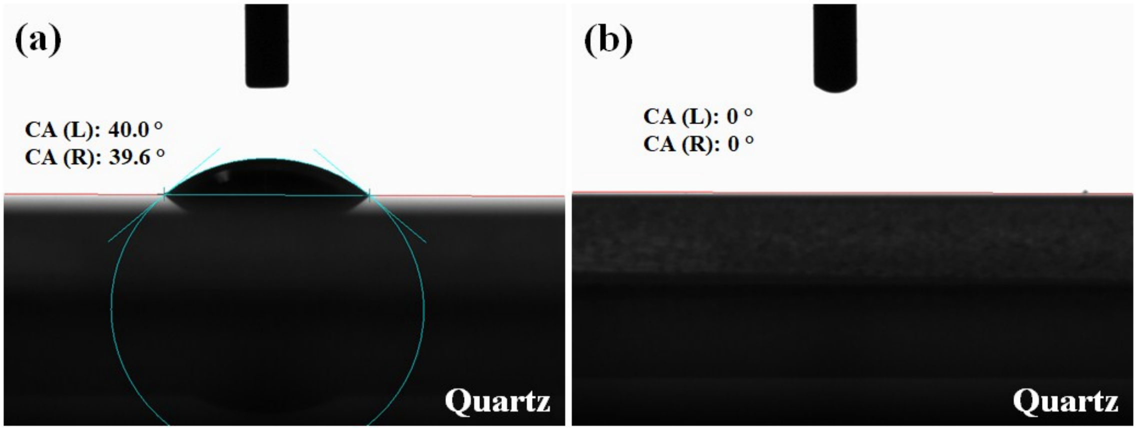


Fig. S9 CA of DI water droplets on quartz substrates (a) before and (b) after annealing in air at 550 ºC for 10min.

REFERENCES

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