Supporting Information

External Condition-induced Interfacial Charge Transfer in the Single-Walled Carbon Nanotube/Graphene van der Waals Heterostructures

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Figure S1 The histograms of a) $2D^+/G$ intensity ratio and b) $2D^+$ band FWHM in SWCNT/graphene vdW heterostructures, and pure graphene. The $2D^+$ FWHM and the $2D^+/G$ intensity ratio of SWCNT/graphene vdW heterostructures were decreased compared to graphene.

Figure S2 2D band of pure graphene as tend of different relative humidity.

Table S1 Trends in the 2D band changes of SWCNT/graphene heterostructures and charge transfer at the interfaces under different external conditions

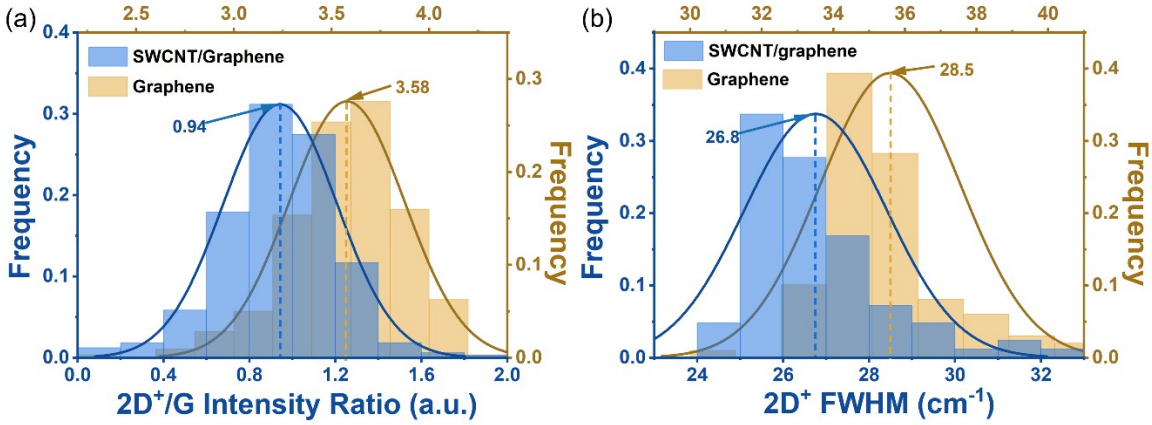

Figure S1 The histograms of a) $2D^+/G$ intensity ratio and b) $2D^+$ band FWHM in SWCNT/graphene vdW heterostructures, and pure graphene. The $2D^+$ FWHM and the $2D^+/G$ intensity ratio of SWCNT/graphene vdW heterostructures were decreased compared to graphene.

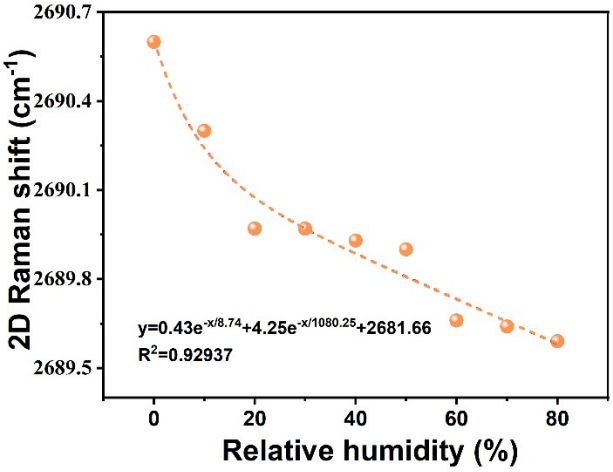

Figure S2 2D band of pure graphene as tend of different relative humidity. The curve fitted by $y = 0.43e^{-x/8.74} + 4.25e^{-x/1080.25} + 2681.66$, where y corresponds to the $2D^+/G$ intensity ratio, x is the relative humidity. The R^2 values obtained by fitting is greater than 0.98, indicating that the fitting line agreed with the present data in figure.

Table S1 Trends in the 2D band changes of SWCNT/graphene heterostructures and charge transfer at the interfaces under different external conditions

External condition	$2D^-$ Raman shift	$2D^+$ Raman shift	Charge transfer at different interfaces		
Voltage (-10 V~10 V)	Redshift (-4V as neutral point)	Redshift	/	/	SWCNTs →Graphene
Humidity (0~80% RH)	Redshift	Redshift	H_2O → SWCNTs	H_2O →Graphene	SWCNTs →Graphene
NO_2 atmosphere (0~500 ppm)	Redshift	Blueshift	NO_2 →SWCNTs	Graphene→NO_2	SWCNTs →Graphene
Temperature (295 ~ 473 k)	Redshift	Redshift	/	/	SWCNTs →Graphene