Supplementary information for

Strong-coupled Hybrid Structure of Carbon Nanotube and MoS_2 Monolayer with Ultrafast Interfacial Charge Transfer

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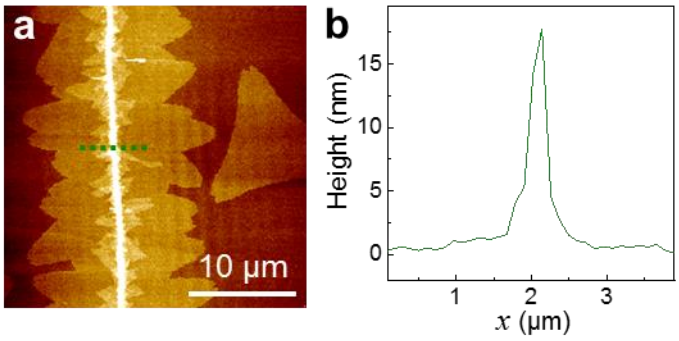
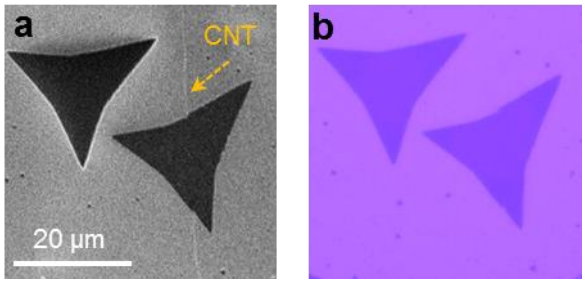
The supplementary information includes:

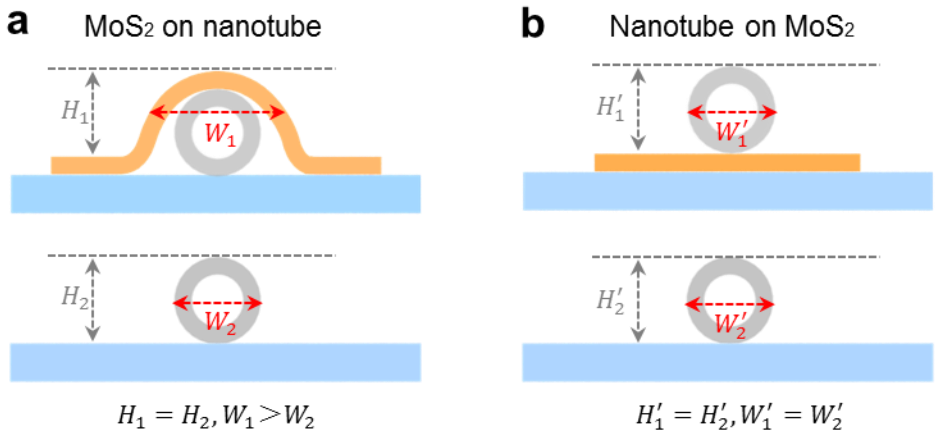
Supplementary Fig. 1-4



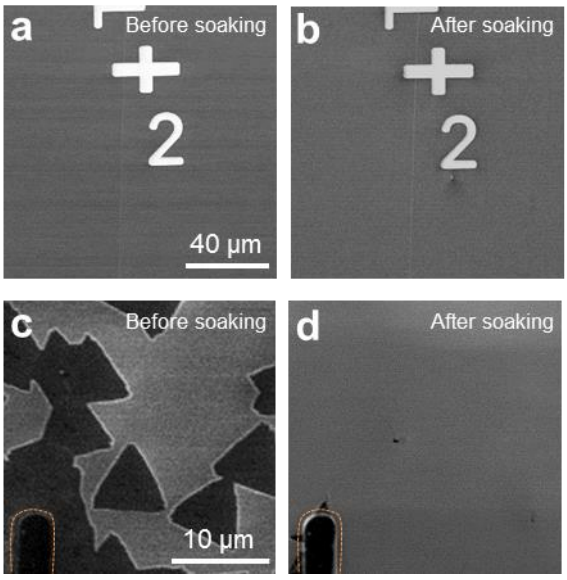
Supplementary Fig. 1. (a) Atomic force microscope (AFM) image of nanotube-multilayer MoS_2 hybrids with dirty interface. **(b)** AFM cross-sectional profile along the green line indicated in (a) shows that the height of MoS_2 along nanotube exceeds 15 nm, and confirms the multi-layer MoS_2 structure.



Supplementary Fig. 2. (a) Scanning electron microscope **(**SEM) image and **(b)** the corresponding optical image of a nanotube-MoS_2 monolayer hybrid structure with clean interface. Nanotube outline cannot be seen in the optical image, but it shows a uniform MoS_2 monolayer contrast on and off nanotube.



Supplementary Fig. 3. Schematic diagram of two possible stacking geometries in nanotube-MoS_2 hybrids. (a) MoS_2 climbing over nanotube geometry. Height and width illustration of the same nanotube hybridized with MoS_2 monolayer (top panel) and on bare substrate (bottom panel). **(b)** Nanotube sitting on MoS_2 geometry. Situations for the same nanotube on MoS_2 (top panel) and on bare substrate (bottom panel) are identical.



Supplementary Fig. 4. (a-b) SEM images of a nanotube on 300 nm SiO_2/Si substrate before (a) and after (b) soaking in water. **(c-d)** Optical images of MoS_2 samples on 300 nm SiO_2/Si substrate before (c) and after (d) soaking in water. Pure MoS_2 can be easily washed out by water immersion but nanotube cannot.