Supporting Information

S1: Experimental setup and growth mechanism of CNF

Figure S1 (a) represent a schematic of CVD system whereas growth mechanism of carbon nanostructure coating is shown in Fig. S1 (b).

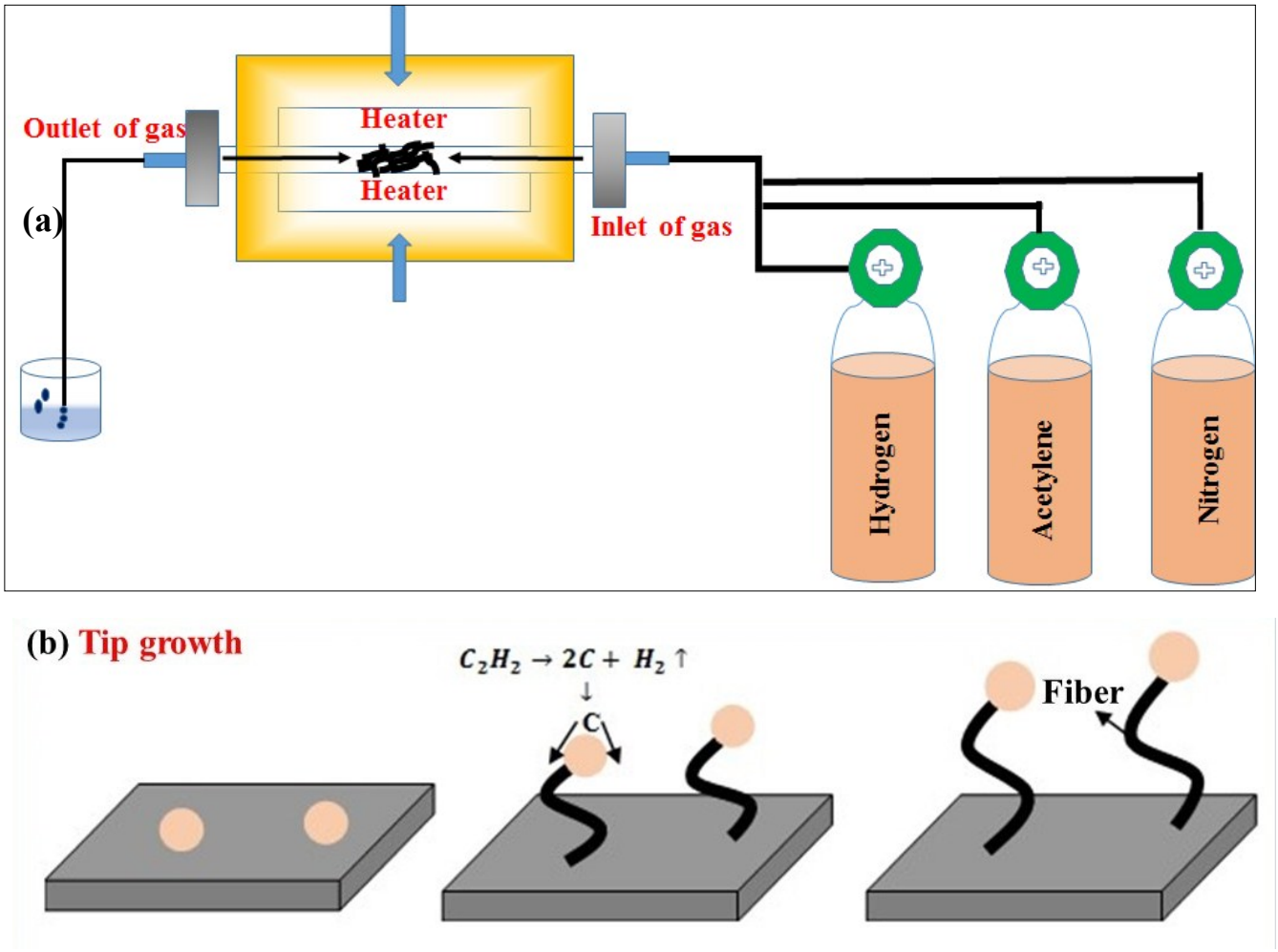

Fig. S1 Schematic of (a) chemical vapor deposition (CVD) system (b) growth mechanism of carbon nanostructure coating using CVD method.

S2: Calculation of coating thickness

The thickness of the deposited CNF on coated glass is determined by formula

$$Thickness\ (\mu m) = \frac{mass\ (mg) \times 10}{Area(cm^2)\ \times density(gm/cm^3)}$$

Here, the density of the CNF is taken as 2.1 g/cm^3, mass of the coated CNF is 324g and coated area is 18.79 cm^2.

The uncoated substrates (ACF and glass) have dimension of 20 × 16.8 × 0.65 mm and 74.9 × 25.14 × 1.31 mm with initial weight of 0.06 g and 5.9 g respectively. Weight of the coated substrate (ACF and glass) are 0.08 g and 6.21 g respectively. Difference between weight of the coated and uncoated substrate is weight of the deposited CNF on substrate (ACF and glass). For ACF substrate, the weight of the deposited fibre is approximately 0.02 g with an area of 20 × 16.8 mm and that for glass is 0.32 g and an area of 74.9 × 25.14 mm. The thickness then comes out to be 80.9/2 = 40.5 µm (Division by two is because coating is on both the sides of the glass). To validate the results of coated thickness, the thickness of approximately 40 µm is measured by difference between uncoated (1.31 mm) and coated glass (1.35 mm) and it is also verified by the cross-section SEM image of coated glass which reveals the average thickness of the deposited CNF on glass substrate is 39 µm as shown in Fig.S2. Figure S2(a) shows cross-section SEM image of deposited CNF on coated glass observed from front side where Fig. S2 (b) represent for the back side.

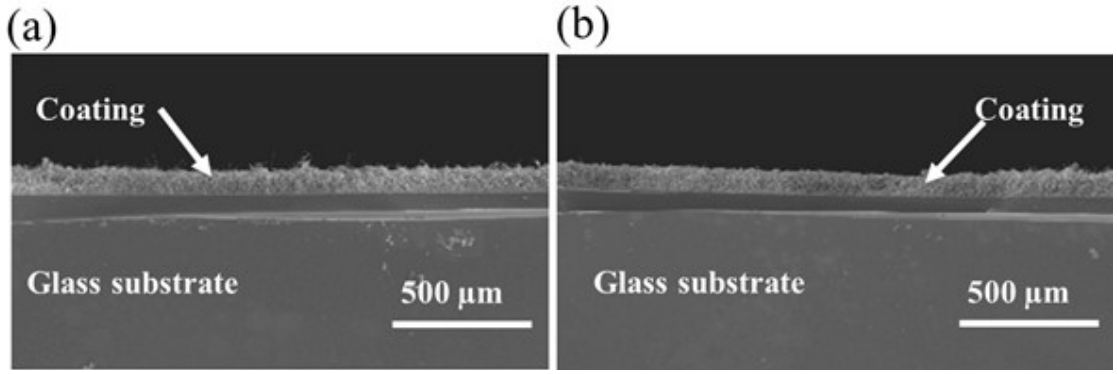

Fig. S2. Cross-sectional SEM images of coated glass: (a) front side (b) back side.

S3: SEM image of uncoated and coated ACF

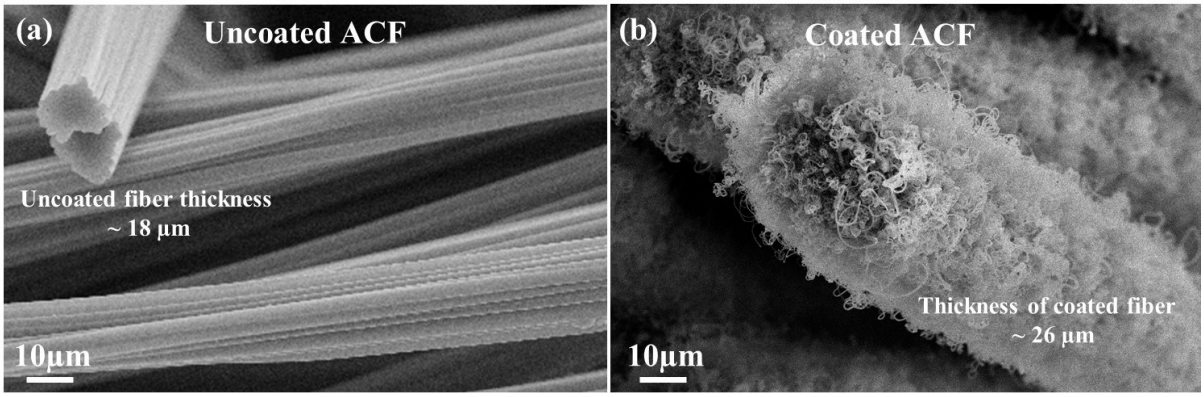

Fig. S3. SEM images of (a) uncoated ACF (b) coated ACF.

S4: Energy dispersive spectroscopy (EDS) spectra of coated substrate

Energy dispersive spectra of coated ACF shown in Fig. S4(a) whereas for coated glass is shown in Fig. S4(b).

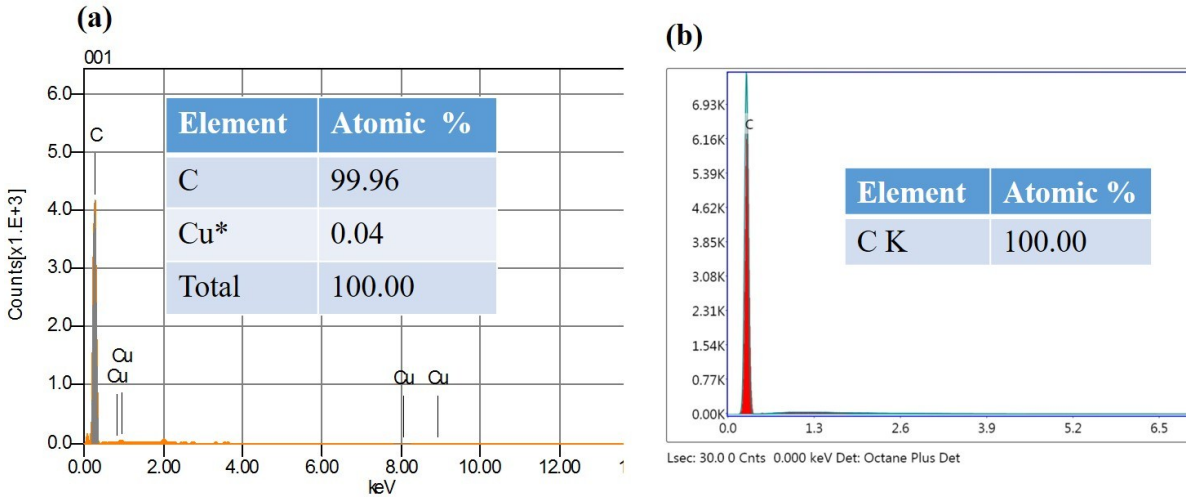

Fig. S4 EDS of (a) coated ACF (b) coated glass.

S5: Calculation of virtual contact area fraction of grown CNF using binarization process

The water contact angle of superhydrophobic coated surface is revealed from the SEM image by applying image binarization technique using an ImageJ software. To convert the SEM image into binary image, a set of threshold values are taken to distinguish far from near view with the assumption that far view are darker than near one. This is based on the assumption that water will come into contact with the brighter (nearer) point rather than the darker (farther) point. Then the processed image shows virtual contact area and its fraction ($Ø_v$), calculated as percentage of brighter area. The wettability of bulk carbon fibre cannot be determined because of its fibrous structure. Instead the intrinsic contact angle of Graphite is measured (θy =86^o) and taken as the intrinsic contact angle of CNF. When the water contact angle on coated ACF and glass surface reaches 146^o and 156^o respectively, the real contact area fraction according to equation 2 are calculated as 15.9% and 8.0% respectively. To calculate virtual contact area fraction, randomly selected SEM images of coated substrate are subjected to binarization process as shown in Figure S4. For coated ACF substrate, virtual contact area fraction (15.8%) becomes nearly equal to the actual contact area fraction (15.9%) at a threshold value of 198. Similarly, the threshold value for coated glass substrate is found to be 165 at which virtual contact area fraction (8.1%) is nearly equal to the actual contact area fraction (8.0%). SEM image of coated ACF (Fig. S5(a)) is processed for its binarization (Fig. S5(b)) using ImageJ software. Similarly, SEM image of coated-glass (Fig. S4(c)) is presented along with its binarized image (Fig. S5(d)) in order to elicit the coverage of the deposit. This quantification has elicited that the contact area of water on coated glass surface is smaller (8.1%) than coated ACF (15.8%).

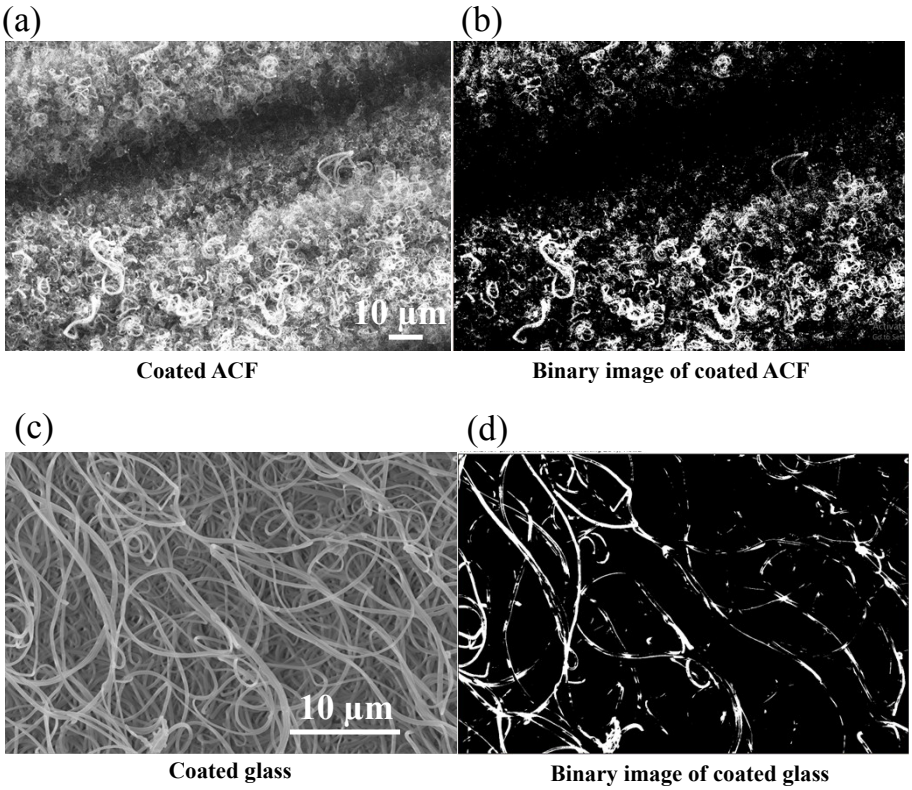

Fig. S5 (a) SEM image of coated ACF, (b) binarization of image (a) using ImageJ software at selected threshold value of 198, (C) SEM image of coated ACF, (d) Binarization of image (c) using ImageJ software at selected threshold value of 165.