ELECTRONIC SUPPLEMENTARY INFORMATION

SI. 1 Uniform growth of VG sheets on metallic wire surface. Fig. S1 shows SEM images of the deposits at different locations on the SS wire surface. Results show that, the length of the VG growth region was ~30 mm, including a uniform growth region of ~20 mm. In the uniform growth region, the morphology (e.g., height and width of an individual nanosheet, and density of networks) of VG sheets exhibited good uniformity in both circumferential and axial directions.

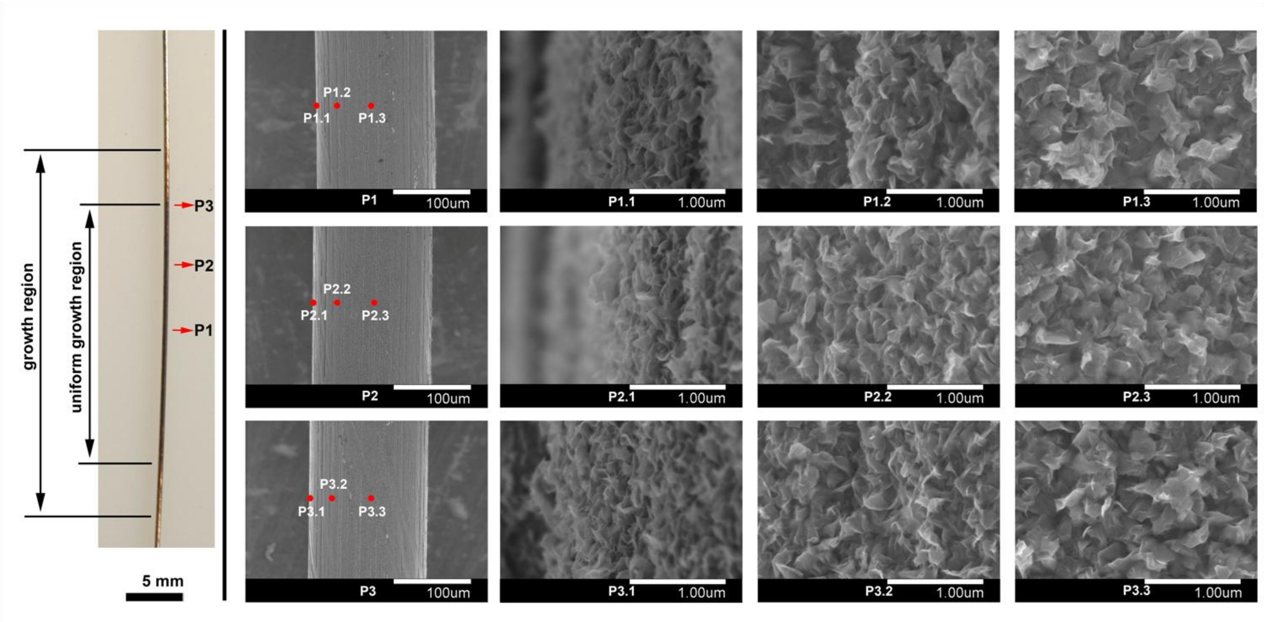

Fig. S1. A picture of the VG-coated SS wire and corresponding SEM images of the deposits at different locations on the SS wire surface.

SI. 2 Bath sonication test. To investigate roles of the substrate material on the graphene binding stability, a set of bath sonication treatment (power: 12 W; media: ethanol) was carried out over two VG-coated wires of different materials, i.e., tungsten and stainless steel, respectively. As shown in Figure SI.2, after 1.5 min bath sonication, VG sheets on tungsten wire surface were damaged to a certain degree (see Fig. S2a) while those on stainless steel wire surface were kept well (see Fig. S2c); after 3 min bath sonication, only very sparse VG sheets remained on the tungsten wire surface (see Fig. S2b) and obvious defects could be discerned even in the lower magnification SEM image (see the inset of Figure SI.2b), while VG sheets on the stainless steel wire still kept their original morphology although the height of VG sheets was obviously smaller (see Fig. S2d). These results have led us to conclude that the stainless steel wire shows better VG binding strength than the tungsten counterpart.

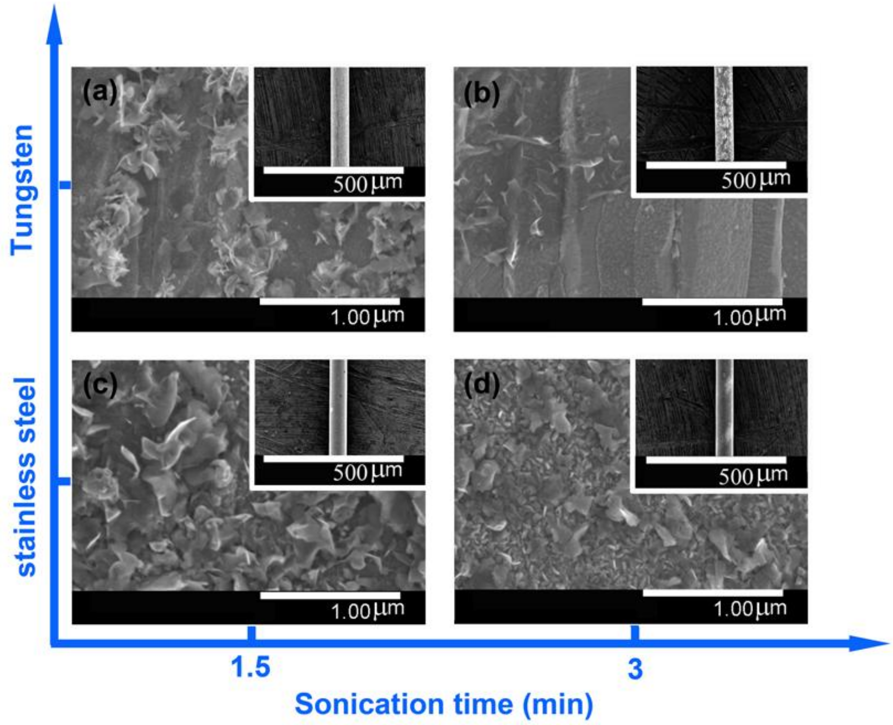

Fig. S2 SEM images of VG sheets on tungsten (a nd b) and stainless steel (c and d) wires after bath sonication treatments.

SI. 3 Current sampling. For a given supply voltage, the discharge current is the time-averaged value of 121 samples automatically collected by LabView software in ~45 s, as illustrated in Fig. S3 for VG-coated wire discharge at a supply voltage of 4.68 kV. To ensure stability of the corona discharge, a precision error as small as ~0.5% of the average value is required. The average value $\bar{I}$ is calculated as:

$$\bar{I} = \frac{\sum_{i=1}^{n} I_i}{\mathrm{n}} \qquad \text{(SI.1)}$$

where n is the sample number, i.e., 121 in the current work.

The precision error ΔI is calculated according to the Student t-Distribution:

$$\Delta I = t_{\alpha/2} \frac{\delta}{\sqrt{\mathrm{n}}} \qquad \text{(SI.2)}$$

where $t_{\alpha/2}$ is 1.98 (degree of freedom is set as n-1=120), assuming a 95% confidence level, i.e., α/2=0.025; the sample standard deviation δ was calculated as:

$$\delta = \left[\frac{1}{\mathrm{n}-1} \sum_{i=1}^{n} (I_i - \bar{I})^2 \right]^{\frac{1}{2}} \qquad \text{(SI.3)}$$

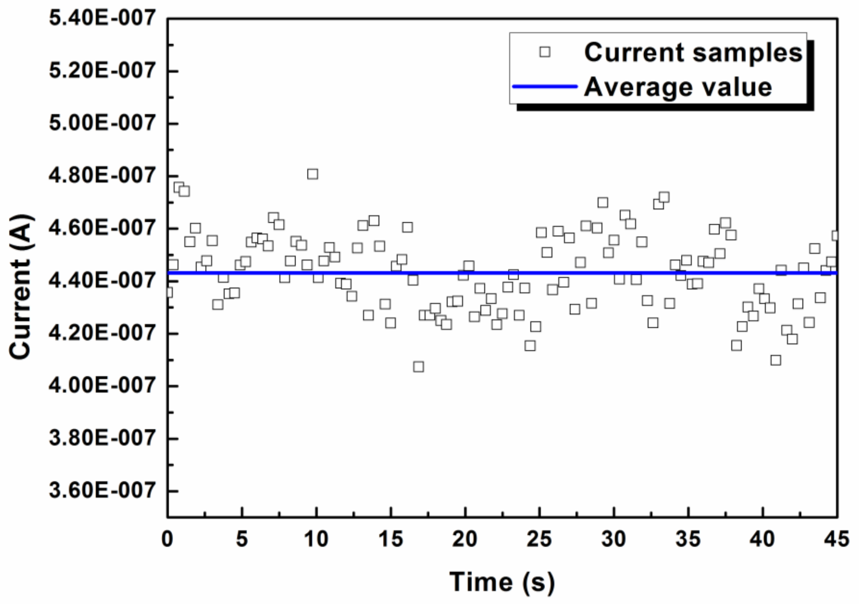

Fig. S3 Typical fluctuations of corona discharge current during the 45-s sampling for the VG-coated wire discharge at a supply voltage of 4.68 kV.