Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

Investigation of electronic properties of chemical vapor deposition grown single layer graphene via doping of thin transparent conductive films

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Thickness measurement of 0.78 w/v PEDOT: PSS film.

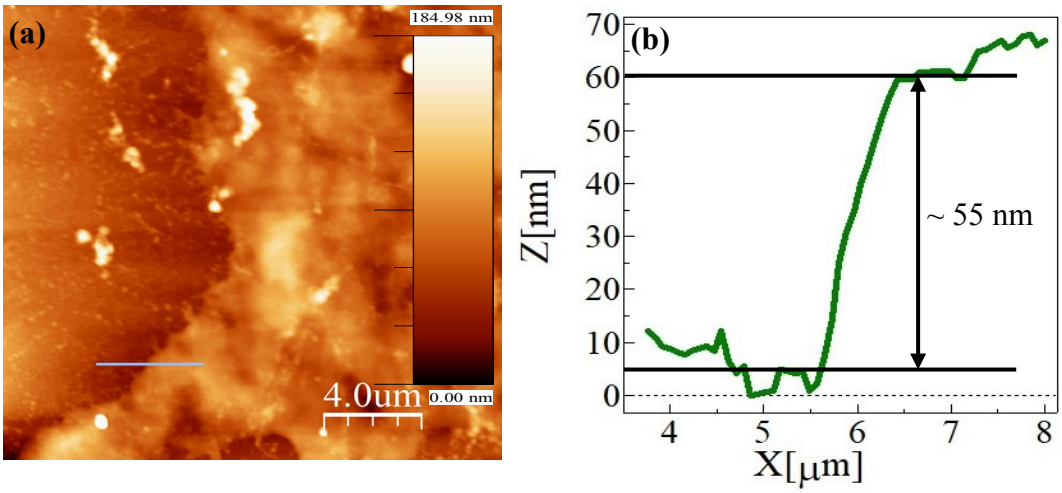

Fig.S1. (a) AFM image of 0.78 w/v PEDOT:PSS film and (b) height profile for the thickness measurement

KPFM technique for work function measurement

In brief, when a conducting cantilever tip is kept near the sample surface in the KPFM measurement, an electrical force is produced between the sample and tip due to the differences in their Fermi energy levels. The cantilever tip used for KPFM measurement is selected to be a different material to the sample, therefore the work function of the sample (φ_{sample}) and tip (φ_{tip}) are different. The energy diagram representing the sample and tip Fermi level is shown in Fig.1. The energy levels of the sample and tip are shown in Fig. 1(a), where the sample and tip are separated by distance (d), and no electrical connection is established between them. Also, the Fermi energy levels of sample and tip are different but their vacuum levels are aligned. For the requirement of thermodynamic equilibrium, if the sample and tip are in contact both have equal Fermi levels. When the sample and tip are in contact electrically, electrons transfer from higher Fermi level to lower Fermi level and cause the system will reach an equilibrium condition (Fig.

1(b)). Furthermore, a surface charge developed on the tip and sample, with an apparent potential difference such as contact potential difference (V_{CPD}) will form. An external dc potential (V_{DC}) equal $-V_{CPD}$ can be applied to eliminate the surface charge between tip and sample is shown in Fig. 1(c). When the charge on the sample and tip is eliminated, the Fermi level of the sample shifted to its original position. This means that the value of external potential (V_{DC}) that eliminates the charges developed by the V_{CPD} is equal to the difference between φ_{tip} and φ_{sample}. Therefore, φ_{sample} can be calculated only when the φ_{tip} is known.

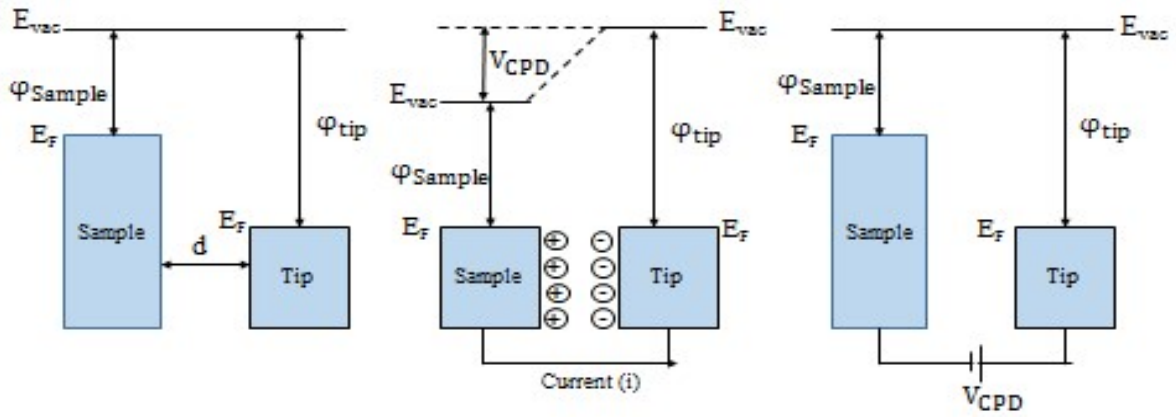

Fig. S2. Electronic Energy levels of the sample and AFM tip for (a) sample and tip are separated with no electrical contact, (b) the sample and tip are in electrical contact, and (c) An external potential (V_{DC}) is applied between sample and tip to eliminate the charge generated by V_{CPD}. In the diagram, Evac is the vacuum energy level and E_F is the Fermi energy level.