Electronic Supplementary Material (ESI) for RSC Advances.


# Defect-induced metallic-to-semiconducting transition in multilayer graphene

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Supporting Information

**SI 1: Thickness approximation of multilayer graphene.**

The Micromechanical cleavage method is chosen to peel multilayer graphene from highly oriented pyrolytic graphite (HOPG) by using scotch-tape and transferred to a $SiO_2$/Si substrate. Atomic force microscopy (AFM) is used to measure the thickness of the exfoliated MLG flake. The AFM morphology of the pristine-MLG is shown in Fig. S1; the surface of the pristine-MLG is more uniform, and the thickness was approximated by drawing a line profile along the x-axis from the $SiO_2$/Si substrate to the MLG flake. The height difference between the $SiO_2$/Si substrate and the MLG flake is considered as the thickness of the MLG flake.

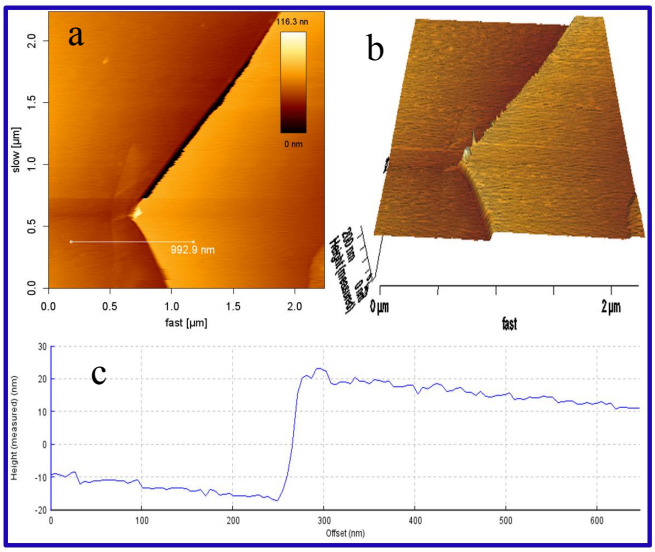


**Fig. S1 –** AFM analysis: (a) 2D image of pristine-MLG and (b) 3D image of (a). (c) The line profile image corresponding to the *x*-axis of (a) which shows the thickness of ~ 35 nm.

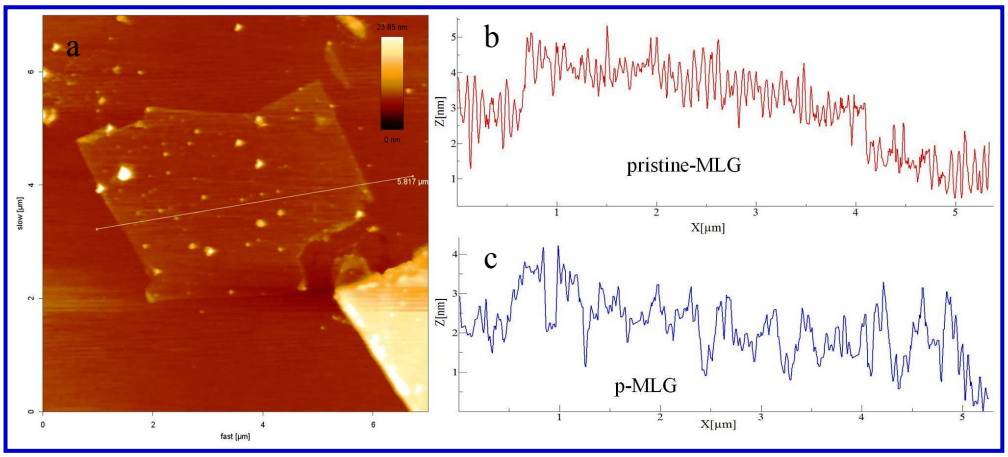


**Fig. S2 –** (a) The two-dimensional AFM image of the p-MLG (b) and (c) Line profile image corresponding to the *x*-axis of (a) before plasma irradiation (pristine-MLG), after plasma irradiation (p-MLG) respectively.

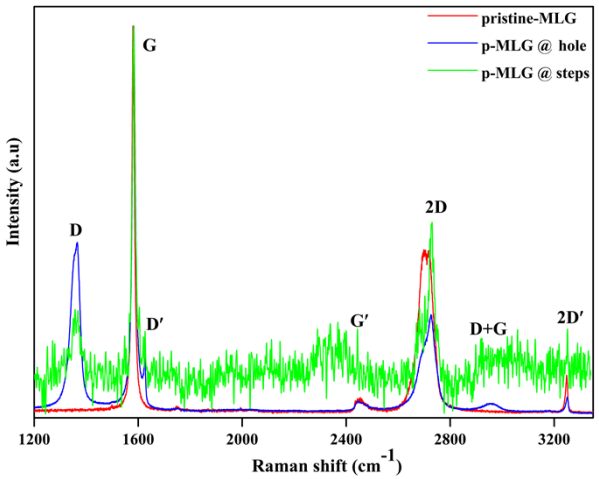


**Fig. S3 -** Micro-Raman spectrum of the pristine (red) and p-MLG device at different places holes (blue) and steps (green).

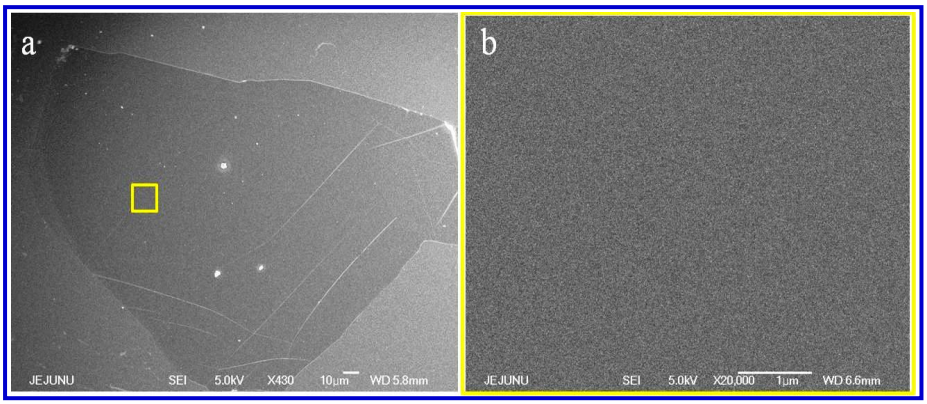


**Fig. S4-** FESEM image of pristine-MLG (a) Surface of the pristine-MLG (b) Magnified image of the marked (yellow color) area of the pristine-MLG (a) shows the smooth surface.

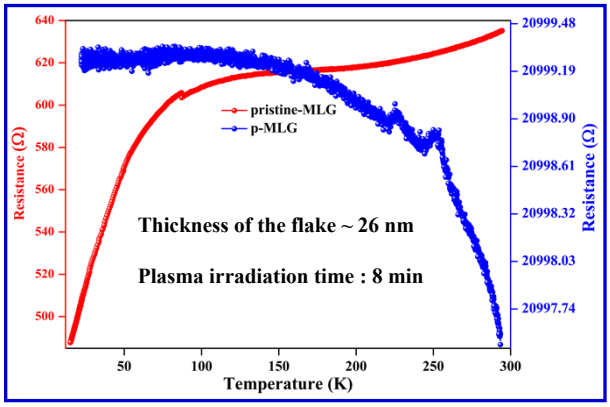


**Fig. S5-** Temperature dependence of the resistance *R (T)* of pristine and p-MLG device.