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1P23 - Remote plasma assisted graphene growth for designing graphene/Si hetero-interfaces

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Graphene has gained a lot of attention due to its exception properties of high electron mobility (104-5 cm2/Vs), electric current carrying capacity (˜108 A/cm2), optically transparent (> 95 %) and considered as an excellent candidate for next-generation optical, electrical and spintronic devices. Graphene properties can be modified by altering the graphene/substrate interfaces by changing the chemical potential gradient, thereby, induced effective field at interfaces. Here, in the present research, we demonstrated the graphene/silicon interfaces to design the Schottky barrier with a large potential gradient. Graphene was synthesized using the plasma assisted chemical vapor deposition method and was transferred on the silicon substrates. The quality of graphene was confirmed using the Raman spectroscopy technique. The presence of equally intense G and 2D peaks shows the growth of high-quality graphene. Thereafter, the graphene/silicon interface was exposed to the hydrogen plasma at 30 Watt and distance between the plasma electrode and graphene/silicon was kept 15 cm to avoid any direct damage on the graphene/silicon interfaces. Plasma was monitored using optical emission spectroscopy during the graphene synthesis and plasma assisted hydrogen functionalization of graphene/silicon interface. The hydrogen desorption was performed by the thermal annealing of graphene/silicon interface at 150 ⊠C. The adsorption and desorption hydrogen on graphene/silicon was also estimated with the help of a probe station by measuring the resistance of graphene keeping distance between the two electrodes fixed. Electrical measurements show the improved diode type behavior at graphene/silicon interface after hydrogen functionalization. Results will be useful to design graphene interfaces for spintronics device to improve the effective field at the graphene hetero-interfaces.

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