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Monitoring the electrical property of graphene transistor by the oxygen vacancy generation of top oxide layer TAE KWANG KIM, HYE WON DU, SO MYEONG SHIN, Sejong Univ., JONG-HYUK YOON, EUN-KYU LEE, Samsung Techwin R&D center, SEUNGMIN CHO, SUNAE SEO, Sejong Univ., SAMSUNG TECHWIN R&D CENTER COLLABORATION — Fermi level tuning in graphene is crucial for the applications such as conducting electrode or semiconducting electronic device. It is generally achieved by both non-covalent and covalent molecular doping. Former is related with weak Vander Waals interaction which keeps electronic band structure of graphene intact. However, the molecular doping is sensitive to the air exposure so that the degradation of electrical property induce reliability issue without passivation. Here, we suggest self-passivated and well-controlled graphene doping by changing the resistivity of interfacial oxide. The oxygen in transition metal oxide is released at the high temperature under vacuum due to the concentration gradient at the interface leaving electrons which is probable to be conduction electrons by thermal activation. This indicates oxygen vacancy generates impurity level close to conduction band minimum and forms insulating oxide into N-type semiconductor. We monitored the annealing time dependent electron doping concentration of graphene under vacuum. Along with the change of charge neutrality point, to understand the conduction mechanism of graphene at room temperature with Fermi level increase, we investigated the mobility variation of electron and hole carrier versus doping concentration.

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