

Novel One-pot Route for Growth of Patterned Graphene and Its Mechanism

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Graphene is expected to play a role as an essential building block of 2D integrated circuit due to the simple modification of its electrical properties by doping and patterning. However, in order for 2D integrated circuit to be well worked, it is necessary to find another building block as insulator and combine these two building blocks into one circuit. Recently, although the lateral hetero-structures with graphene and hexagonal boron nitride can be grown using two-step CVD method, it is complicated and not applicable to the system with more than two components. Here, we report that one step growth of graphene/amorphous carbon (G/a-C) hetero-structures from solid source as polystyrene (PS) via UV irradiation. The chemical pattern of neat/cross-linked PS via UV irradiation on copper foil converted to the pattern of G/a-C in CVD. Because the resistance of a-C is 100 times higher than that of graphene, amorphous carbon is worked as insulator. Also quantum Hall effect (QHC) is measured in the resulting G/a-C lateral hetero-structure, that means the interface of G/a-C is well defined and proves good quality of graphene. Our approach can suggest versatile method for growth of hetero-structure with various 2D materials.