Surface modification and patterning of graphene using PDMS-interface bonding

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There has been considerable interest in graphene patterning with feature sizes from 100 μm to sub-10nm, since graphenes of sub-10nm scale widths have possibilities for room temperature transistor applications due to a large electronic band gaps (1-3), while graphenes of 100 μm scale widths have been focused on electrodes applications due to their flexibility, transparency and exceptional electronic conductivities (4-6). Such graphene patterns have been fabricated by a conventional lithography and dry etching. Here we present a convenient and scalable method for graphene patterning by soft lithographic technique using only PDMS (poly-dimethylsiloxane) without any chemical agent. So far, graphene patterning using nanoimprinting method has been hampered by chemically inert surface of graphene. Our key strategy for the patterning of graphene using PDMS is a three-step sequence involving the PDMS diffusion, modification of PDMS surface to hydroxyl-terminated self-assembled layer and tailoring the graphene utilizing PDMS-interface bonding. Our approach, unlike earlier reported dry etching-based methods, is based on mechanically tearing the graphene. This facile and scalable method can be a platform process from 100 μm width for electrode to sub-10nm width for transistor applications.

References

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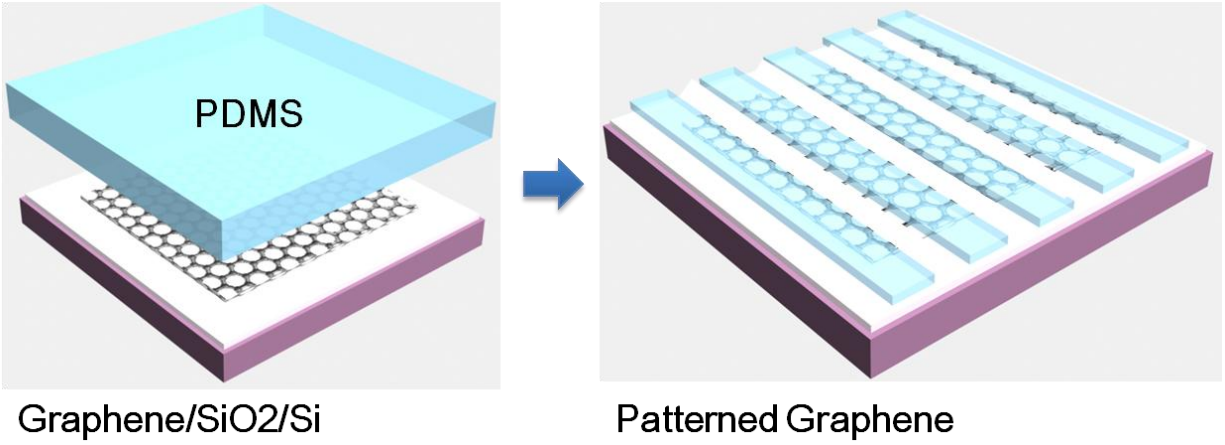
Figures



Graphene patterning using PDMS without any chemical agent.