Application of Graphene Materials as Electrodes for Molecular Electronic Devices

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Vertical devices based on molecular monolayers deposited as SAMs or Langmuir Blodgett (LB) films between top and bottom electrodes are very attractive architectures for molecular electronics. However, this device layout in general suffers from ill-defined junctions when vapor deposited metal top-contacts are applied.[1] A promising solution to this top-contact problem is the application of graphene materials as the actual contacts or as protective interlayers between molecules and metals.

Deposition of a dense LB film of single layer graphene oxide flakes is shown by x-ray reflectometry to provide an efficient protection of fragile molecular LB films from vapor deposited titanium-gold top electrodes.[2] Large are thin films (≈5 nm thickness) of reduced graphene oxide (rGO) can be deposited as top contacts to molecular SAM's grown in lithography defined micro wells on an array of bottom electrodes (Figure 1). The conductive rGO film complete a devices with two molecular junctions in series (junction I), or after vapor deposition of a metal cross wire a well-defined permanent monolayer device (junction II).[3] In this way rGO is demonstrated to function as both a protective layer and as soft electrodes for molecular devices. The transparency of the rGO film is further exploited to fabricate a light switchable electronic device (junction I) from a SAM of photo chemical active molecules.[4]

References

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Figures

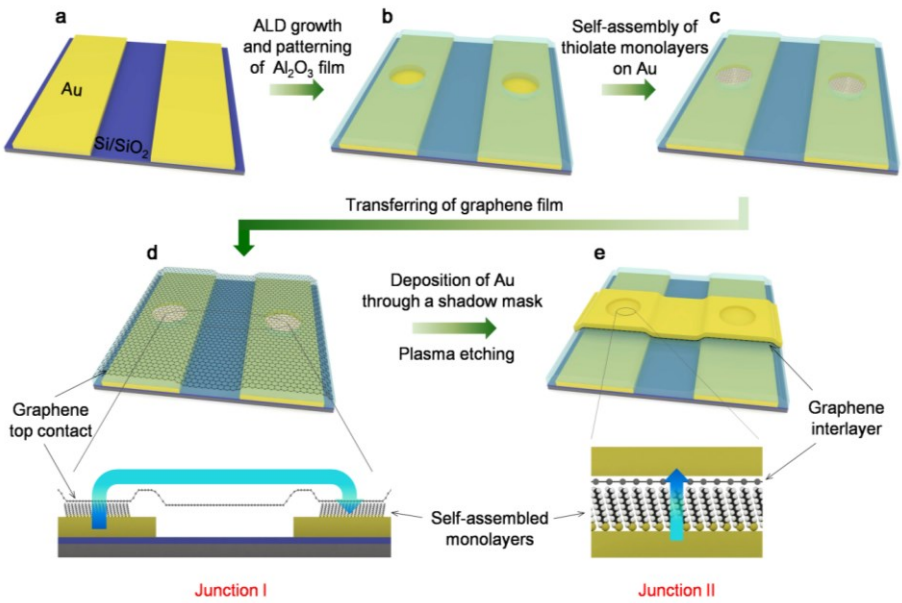

Figure 1. Ultra-thin films of reduced graphene oxide may serve as transparent top electrodes and connector for a device with two molecular junctions in series (junction I) or as a protective inter layer between molecules and vapor deposited top contacts (junction II).