Solution-Processed Ultrathin Chemically Derived Graphene Films as Soft Top Contacts for Solid-State Molecular Electronic Junctions

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A major goal of molecular electronics is to understand charge-transport properties of single molecules and their ensembles. Ultimately this will pave the way for electronic components made of molecular building blocks that can overcome the limits of conventional semiconductor technology.[1,2] Compared with the junctions built on a very limited number of molecules, self-assembled monolayers (SAMs)[3] offer a more reproducible way for the fabrication of molecular electronic devices, and are more amenable to mass production and integration. However, direct in situ evaporation of metals onto SAMs has proven to be too invasive and damaging. Filamentary paths of metals or damages to the molecules can very easily cause shor-circuits.

Here, we report the use of solution-processed chemically derived graphene (CDG) films for non-destructive fabrication of molecular electronic junctions.[4] Wafer-scale continuous films with sub-10 nm thicknesses can be uniformly delaminated from the substrate and transferred without polymer supports onto SAMs to function as soft electrical top-contacts. Two types of molecular junctions are developed demonstrating a versatile application of the CDG thin-films. We believe this protocol will greatly enrich the test beds for molecular electronics due to its low-cost, easy-processing and flexible nature.

References

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Figures