Toward Graphene Integration from the Bottom-Up

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Since 2010, graphene has been expected to revolutionize, or at least to enhance silicon-based nanoelectronics. However, the current, fragmented directions of graphene research cannot reach this goal, in part because of the (frustrating) lack of a band gap in graphene, and also because of the lack of connection technique for graphene. Fabricating graphene nanoribbons (GNRs) by molecular assembly is a strategy that promises both to tune graphene's band gap by width control, and to connect the tailored GNR properties to desired contacts by length control. In this talk, I will first discuss the current state of GNR research: from its initial, revolutionary promises, to its present experimental difficulties. Then I will discuss a new bottom-up molecular assembly process,[1,2] which uniquely uses the properties of the supporting substrate: 1) to control the molecular-assembly chemistry, and 2) to interconnect the product GNRs both chemically and electronically. Finally, I posit that these results illuminate the unexplored potential of bottom-up strategies for obtaining atomically precise graphene nanostructures that are well connected to desired contacts—the crucial step toward the integration of graphene and silicone-based nanoelectronics.

References

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