

# Electron Transport in Strain-Engineered Graphene

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There is wide interest in using strain-engineering to modify the physical properties of 2D materials, for both basic science and applications. Deformations of graphene, for example, can lead to the opening of band gaps, as well as the generation of pseudo-magnetic fields and novel electronic states. We demonstrate how controllable, device-compatible strain patterns in graphene can be engineered by depositing graphene on corrugated substrates. We discuss several techniques for creating corrugated substrates [1,2], focusing on periodic spherical curvature patterns in the form of closely packed nanospheres. We show how the smaller nanospheres induce larger tensile strain in graphene, and we explain the microscopic mechanism of this [3]. We also present experimental results demonstrating how a nearly periodic array of underlying nanospheres creates a strain superlattice in graphene, which exhibits mini-band conductance dips and magnetic field effects that depend on the magnitude of induced strain [4]. This control of the strain degree of freedom provides a novel platform both for fundamental studies of 2D electron behavior and for prospective applications in 2D electronic devices.

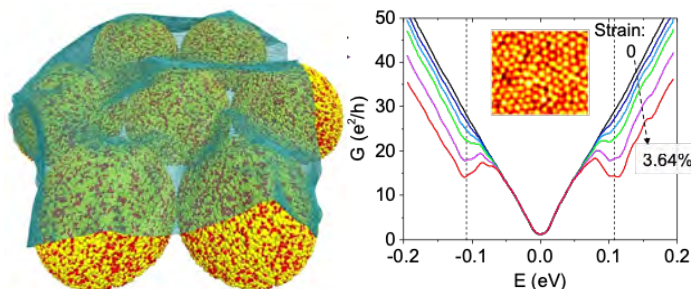


Figure 1. Left: simulation of graphene on nanospheres. Right: calculation of strain-induced superlattice dips.

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[1] S.T. Gill et al, *ACS Nano* **9**, 5799-5806 (2015).

[2] J. H. Hinnefeld et al, *Appl. Phys. Lett.* **112**, 173504 (2018).

[3] S.T. Gill et al, *Nano Letters* **18**, 6121 (2018).

[4] Y. Zhang et al, *njp:2D Materials and Applications* **2**, 31 (2018).

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