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Strain modulation of graphene by nanoscale substrate curvatures

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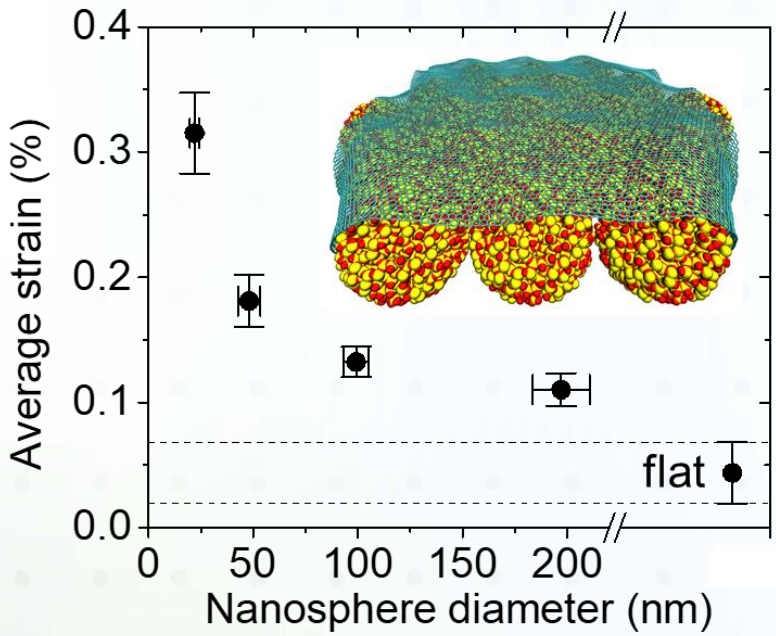
Strain engineering in graphene can enable the generation of pseudo-magnetic fields and bandgaps, which have potential for applications in high speed transistors and dissipationless electronics. A key route to strain engineering two-dimensional (2D) materials, such as graphene, is via underlying nanostructured substrates.

The Illinois MRSEC team has made a key discovery regarding the strain modulation mechanism of graphene on nanostructured substrates. Through joint experimental and theoretical work, the team found that a higher strain can be induced in graphene when the substrate radius of curvature is smaller, due to a spatially inhomogeneous graphene-substrate interaction. This molecular-level understanding is important for strain engineering and electronic device design for 2D materials in general.



Size-dependence of strain in graphene as a function of the diameter of underlying SiO_2 nanospheres.

Y. Zhang et al. Nano Lett. 18, 2098–2104 (2018).

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