Reversible hydrostatic strain in graphene/metallic nanoparticles hybrid material induced by laser irradiation

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Metallic nanoparticles (NPs) were prepared on SiO_2 substrate by local annealing of the evaporated thin films using focused laser beam. CVD-grown graphene was transferred onto the prepared NPs. Subsequent Raman-spectroscopy measurements were performed on the samples using different laser powers. We used higher laser intensity (6 mW) to locally anneal the hybrid material. Low laser powers (0.6 mW) were used to characterize the doping and the strain formed in the same areas both before and after local heating. While we found that higher intensity laser irradiation increased gradually the doping and the defect concentration in SiO_2-supported graphene, the same irradiation procedure did not induce such irreversible effects in the graphene supported by NPs. Moreover, the laser irradiation induced dynamic hydrostatic strain in the graphene on NPs, which turned out to be completely reversible.
These results point out the role of the substrate in the resistance of graphene against laser irradiation, and can have implications in the development of graphene/plasmonic nanoparticle based high temperature sensors.
The paper was published in [1].

References

[1] Pálinkás, A., Kun, P., Koós, A. A. & Osváth, Z., *Nanoscale* 10 (2018) 13417

Figures

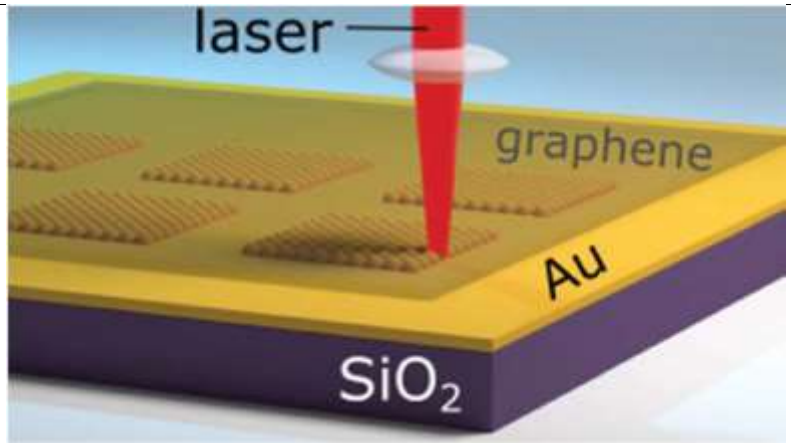

Figure 1: Gold nanoparticles are formed and dynamic strain is induced in graphene by local annealing with a focused laser beam.