The effect of electron and UV irradiation on graphene single layer Raman spectra behaviour

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Abstract
The reactivity and homogeneity of graphene surface, and, therefore its Raman spectra, are expected to be dependent on the quantity and type of structural defects that, as reported in literature, can be induced by various treatments, including irradiation [1-3]. Indeed, for UV irradiation, the evolution of the Raman spectra reveals a strong dependency on the irradiation conditions (light wavelength, electron energy, flux, irradiation dose). Similar behavior was found by other authors [1, 4] using different irradiation conditions.
The present work is focused on surface properties changes, induced by irradiation in graphene materials and investigated by Raman and photoluminescence (PL) spectra at the micro scale. The aim is to investigate more specifically the evolution of the Raman and PL spectra before and after different types of irradiation and their correlation. Irradiation tests are performed in dry conditions for graphene single layer deposited on Ni substrate and, to compare, for highly oriented pyrolytic graphite (HOPG).
As illustrated on Fig.1 for a graphene monolayer on Ni after 1h UV irradiation, the spectra evolve as the concentration of electron irradiation induced defects compared to the native defects increase, moreover the Raman and the PL spectra vary independently as the UV flux used for the 1h irradiation increases.

References

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Figures

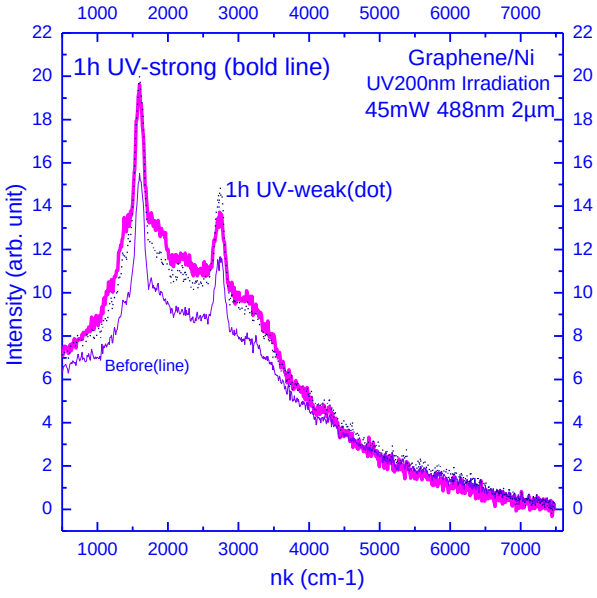

Figure 1: Raman and Photoluminescence spectra (spot 2µm, laser wavelength 488nm, intensity 45mW) in single layer Graphene/Ni before and after 1 hour of ultra-violet (200nm) irradiation at low and high flux