Alexandra Delvallée[1]
Lydia Chibane[1], Nolwenn Fleurence[1], Emmanuel Flahaut[2], Nicolas Feltin[1]
[1]Laboratoire National de métrologie et d'Essais (LNE), 29 avenue Roger Hennequin, 78197 Trappes, France
[2] Centre Inter-universitaire de Recherche et d'Ingénierie des Matériaux - UMR CNRS 5085, 118 Route de Narbonne, 31062 Toulouse
alexandra.delvallee@lne.fr

Correlative imaging of single graphene oxide flake including Raman microscopy technique: sample selection and limitations

Graphene is of major interest for a large number of applications currently under development. However, its production remains complex in large quantities. Graphene oxide (GO) is much easier to synthesize and is therefore often used as a precursor for the preparation of reduced graphene oxide (rGO), whose morphology and physicochemical properties tend more towards graphene as the reduction is more advanced. However, rGO contains a number of structural defects that influence its physicochemical properties, such as its electrical and thermal conductivity, etc.
To control this reduction, it is interesting to follow the evolution of these physico-chemical properties during the GO reduction process, starting with a good characterization of the properties of the initial GO. Based on its expertise in hybrid metrology specifically developed for measuring single nano-object [1], LNE has chosen to characterize the GO through the correlation of various microscopy technique on single GO flake: Raman spectroscopy/microscopy, Scanning Electron Microscopy (SEM), Atomic Force Microscopy and derivate techniques (AFM, SThM, SMM, KPFM). This correlative imaging approach implies that each limitation of each technique have to be considered to select the ideal sample and substrate. Moreover, strategy must be put in place so that when correlative microscopy is performed the location of the flakes is easy and the least invasive techniques are used before the most invasive ones. One of the limitations of Raman spectroscopy/ microscopy when performing correlative microscopy is the degradation of the sample, even at low power [2].
We show in the poster the limitation induced by the various techniques of microscopy employed, more particularly the Raman spectroscopy/microscopy.

References

[1] Crouzier, L., et al. 2019. "Development of a New Hybrid Approach Combining AFM and SEM for the Nanoparticle Dimensional Metrology." Beilstein Journal of Nanotechnology 10.
[2] Torrisi, A., et al. 2022. "Graphene oxide modifications induced by excimer laser irradiations. Surface and Interface Analysis", 54(5), 567–575.

Figures

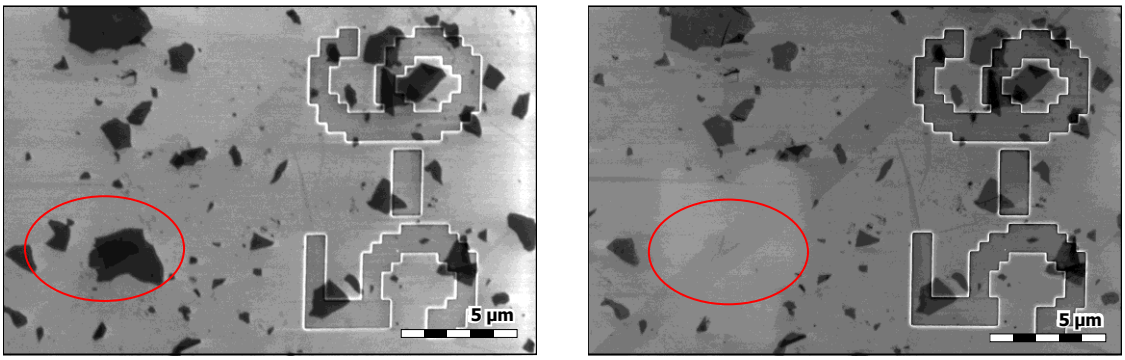

Figure 1: SEM observation of a GO flake deposited on SiO_2 substrate before (left) and after (right) Raman spectroscopy laser irradiation.