Laser beam influence on hexagonal boron nitride

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One of the methods most commonly used in the investigations of two-dimensional nanomaterials is Raman Spectroscopy (RS). The key element of this method is the laser beam, which is focused on the surface of the investigated material on sub-micron area. In this conditions the power density of the electromagnetic radiation may reach high levels leading to the modifications of the properties of the investigated materials [1,2].
In our presentation we will discuss the effect of the laser irradtation on the hexagonal boron nitride (h-BN). We will present our result showing the direct influence of the modifications created with varying laser power densities and photon lengths on mehcanicaly exfoliated h-BN (Fig. 1) on the RS spectra (Fig. 2). We will also present electrostatic force microscopy (EFM) results showing the influence of the modifications on fhe electronic structure (Fig. 3).
Our results show the relation between both disorder levels of the crystalline lattice, charge carrier distribution and the time and power of the laser irradiation.
We will discuss the physical phemonena behind the observed changes and propose the model explaining the behavious of h-BN layers.
Our results show possibility of new applications of h-BN layers (memory devices, nanostructurised electrostatic field controlling) and may indicate new research diractions on this material.

References

[1] P.A. Pivovarov, V.D. Frolov, E.V. Zavedeev, A.A. Khomich, and V.I. Konov, Laser Phys. 26, 84002 (2016)
[2] E. Alexeev, J. Moger, and E. Hendry, Appl. Phys. Lett. 103, (2013).

Figures

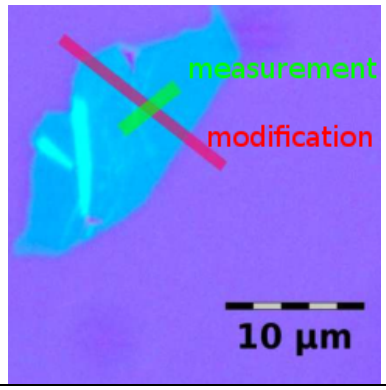

Figure 1: The investigated modification

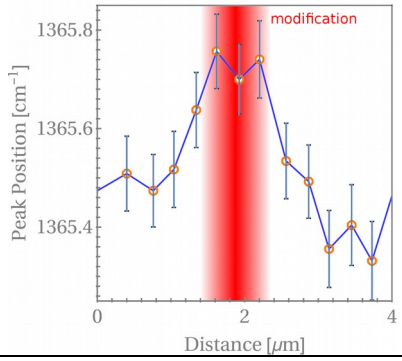

Figure 2: Peak position of E2g line of h-BN along the green path on Figure 1

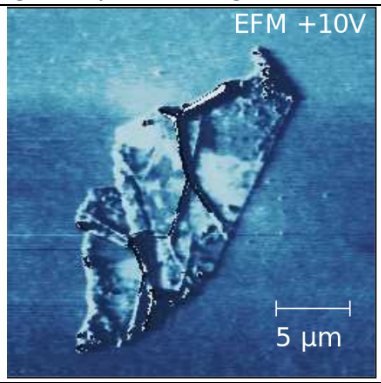

Figure 3: EFM image of the modified flake (Figure 1)