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Heat treated graphitic nanoribbons: electron microscopy and Raman spectroscopy characterization

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Abstract – Changes induced by heat treatments in graphitic nanoribbons have been identified using transmission electron microscocpy. A complete resonance Raman spectroscopy study has been carried out at the bulk level using seven laser excitation energies. Measurements were also carried out on isolated nanoribbons.

Heat treatments of CVD-grown graphitic nanoribbons [1] have demonstrated to induce significant structural changes such as: annealing of defects, in-plane crystallization and loop formation between adjacent layers.

These changes have been characterized by tranmission electron microscopy (TEM), thermogravimetric analysis (TGA), and Raman spectroscopy.

In particular, we have carried out a Raman spectroscopy study of individual nanoribbons and the bulk ribbon sample.

At the bulk level, we have used seven different excitation laser energies to probe the changes induced by the thermal annealing, and quantify the dispersive behavior of the D-, D' and the G'- bands.

At the individual level, we demonstrate that the presence of symmetry-breaking elements concentrates mainly at the edges of the nanoribbons [2].

These results provide new information about the origin the D- and D'- bands on graphitic nanocarbons that contain highly curved domains after thermal annealing.

References

[1] J. Campos-Delgado, *et al*. Chem. Phys. Lett. 469, 177, 2009

[2] J. Campos-Delgado, *et al*. (submitted to Small)