Nitrogen segregation in nanocarbons

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We revisit the question of nitrogen doping in nanocarbon materials [1], specifically graphene and carbon nanotubes, using a combination of experiment and theory at different spatial and energetic resolutions. Implantation coupled with scanning X-ray photoelectron microscopy (SPEM) provides information on sample evolution with implantation dose [2,3], and HRTEM with spatially resolved electron energy loss spectroscopy (EELS) gives details on individual point defect structures [4]. These are combined with a broad-ranging density functional theoretical exploration of doping structure and evolution in an attempt to build up a general large scale picture of nitrogen incorporation behaviour in these and other nanocarbons.

References

[1] For recent publications in this area, see www.ewels.info

[2] "Nitrogen implantation of suspended graphene flakes: Annealing effects and selectivity of sp2 nitrogen species", M. Scardamaglia, B. Aleman , M. Amati, C. Ewels, P. Pochet, N. Reckinger, J.-F. Colomer, T. Skaltsas, N. Tagmatarchis, R. Snyders, L. Gregoratti, C. Bittencourt, Carbon, in press (2014) http://dx.doi.org/10.1016/j.carbon.2014.02.078

[3] M. Scardamaglia, B. Aleman , M. Amati, C. Ewels, N. Reckinger, J.-F. Colomer, T. Skaltsas, N. Tagmatarchis, R. Snyders, L. Gregoratti, C. Bittencourt, Carbon (2014) submitted.

[4] "Atomic Configuration of Nitrogen Doped Single-Walled Carbon Nanotubes", R. Arenal, K. March, C. P. Ewels, X. Rocquefelte, M. Kociak, A. Loiseau, O. Stéphan, http://arxiv.org/abs/1401.5007 (2014)

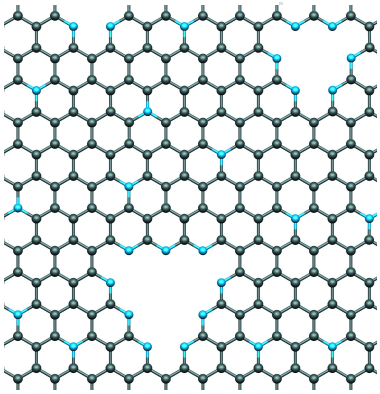

Fig. 1a Typical proposed structural composition of highly nitrogen-doped graphene consistent with SPEM measurements of N-ion implantation.

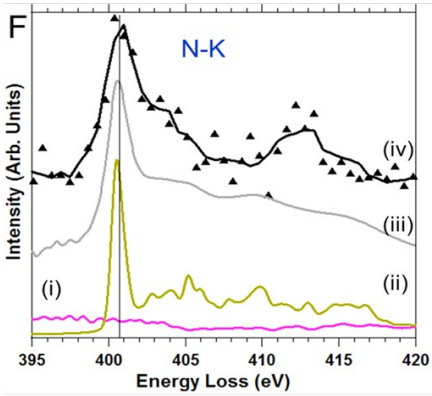

Fig. 1b EELS simulations(i-iii) and experimental (iv) single-pixel spectrum from individual substitutional nitrogen atom in the surface of a single-walled carbon nanotube.