Fast Raman imaging of graphene grown on copper

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Abstract

As graphene progresses from the pure research stage towards production, one of the key requirements is to determine the quality of the graphene produced and, in particular, the number of layers present. These measurements need to be made over larger areas and on a wider variety of substrates than typically used for research.

One of the most frequently used substrates is copper, on which graphene is grown by chemical vapour deposition. The coated sheets can be relatively large area (tens of cm across) and can be relatively uneven.

Raman spectroscopy is, in many ways, an ideal tool for analysing graphene[1], but it can be hampered by slow mapping rates and can be thwarted by the uneven topography of copper films.

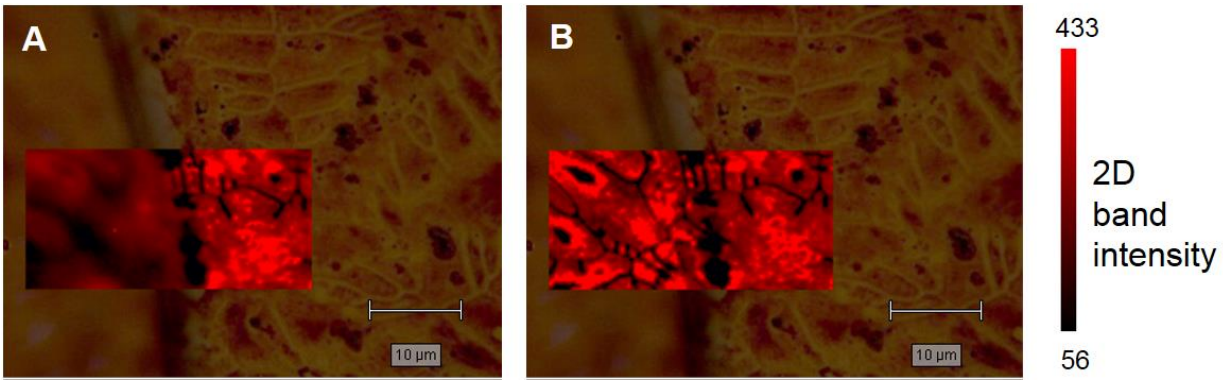
We have overcome these limitations by applying several instrumental techniques. We can use line-focus, rather than point-focus, illumination. This enables higher laser power levels to be employed without damaging the graphene, with corresponding reductions in spectrum acquisition times. We have also implemented a focus tracking technology. This maintains focus during mapping, even on the rough undulating copper substrates, resulting in reliable consistent Raman data acquisition from the whole of the sample.

In combination, these techniques facilitate the analysis of large scale CVD graphene on copper in realistic timescales. We illustrate this with examples of graphene deposited on both silicon and copper substrates.

References

[1] A. C. Ferrari, J. C. Meyer, V. Scardaci, C. Casiraghi, M. Lazzeri, F. Mauri, S. Piscanec, D. Jiang, K. S. Novoselov, S. Roth, and A. K. Geim, Phys. Rev. Lett. 97 (2006), 187401

Figures



Raman images, superimposed on while light microscope images, from a small region of a graphene-coated copper sample. Image (B) uses focus tracking, whereas image (A) does not and, as a consequence, loses Raman data from half of the Raman image.