Method towards defect and residue free application of CVD graphene onto a surface

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Graphene growth via chemical vapor deposition (CVD) on a metal catalyst promises to be the preferred method for large scale synthesis of graphene and graphene based electronic applications [1]. However, substrate and processing conditions of the device are usually incompatible with current CVD graphene growth technology, requiring the transfer of graphene from the growth substrate to the device surface. These additional transfer steps will result in defects in the graphene structure and in residues on the graphene surface that will worsen the characteristics of the graphene device. Different procedures to transfer graphene such as wet transfer, electrochemical delamination or tape-like methods [2] have been reported to yield large area transfer with minor quantity of defects and residues on the transferred graphene. However, these approaches have still not yielded totally clean and defect free graphene. Therefore, the transfer process continues to represent one of the main bottlenecks hindering the production of industrial scale graphene-based electronic applications.

Here, we present a process for the transfer of CVD graphene with a minimal amount of residues. On the one hand, the metal catalyst residues on the graphene are reduced compared to the standard transfer process based on chemical etching of the metal catalyst. On the other hand, fewer residues from the transfer support are found compared to the polymer or tape based transfer methods. Thus, our process yields a cleaner graphene-target surface interface when compared to traditional polymer based counterparts.

Our approach is industrially scalable and could, therefore, enable large area graphene based electronic applications.

References

[1] J. Ryu, et al., ACS Nano 8 (2014), 950-956.
[2] J. Kang,et al., Nanoscale 4 (2012), 5527-5537.

Figures

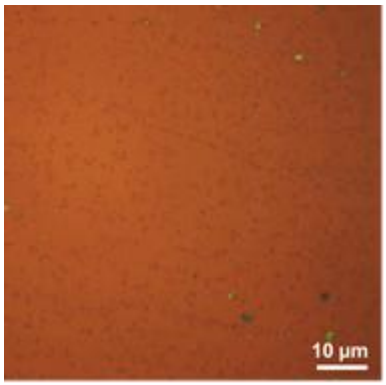

Figure 1: Optical image (magnification is 100) of graphene transferred to a Si/SiO_2 substrate. Cracks on the graphene are not appreciable at this magnification.

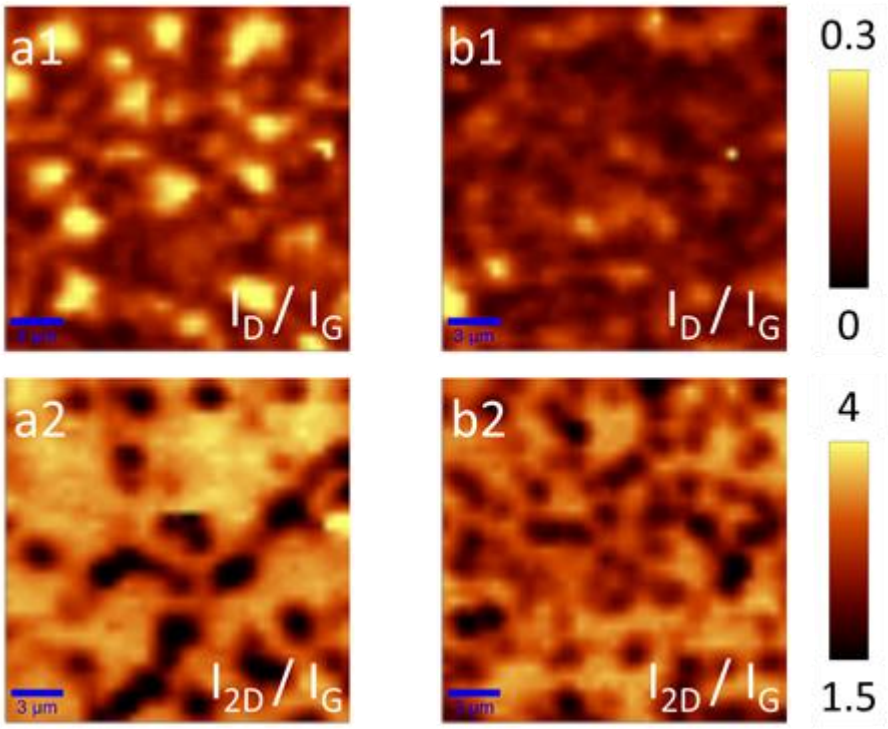

Figure 2: Maps of the D/G (a1, b1) and 2D/G (a2, b2) Raman peak ratios for graphene transferred by the wet transfer method (a1, a2) and graphene transferred by our method (b1, b2). The average 2D/G and D/G peak ratios being alike evidences that our transfer method results in graphene that is as high quality as its wet transferred equivalent.