

Highly Efficient CVD Growth of Bilayer Graphene by Oxidative Dehydrogenation Chemistry

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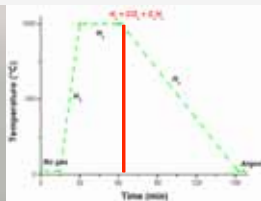
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Introduction

Several Chemical Vapor Deposition recipes have been developed so far for the synthesis of bilayer graphene. However high temperature is required or they exhibit a low reaction yield. Here we report a new route of bilayer graphene synthesis by CVD using acetylene as carbon precursor and oxidative dehydrogenation chemistry. Using this chemistry, CNT's were successfully grown on oxides at low temperature (<750°C)[1].

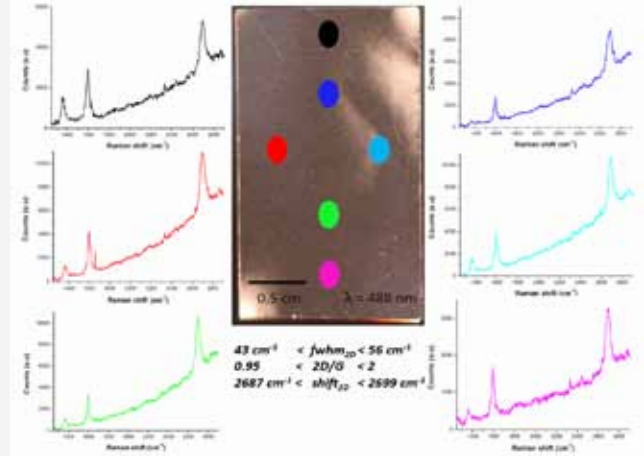
Growth Conditions

$P_{tot} = 0.38$ mbar
 $P_{H_2} = 0.31$ mbar
 $P_{CO_2-C_2H_2} = 0.063$ mbar
 $T = 1000^\circ C$
 $t = 120$ s

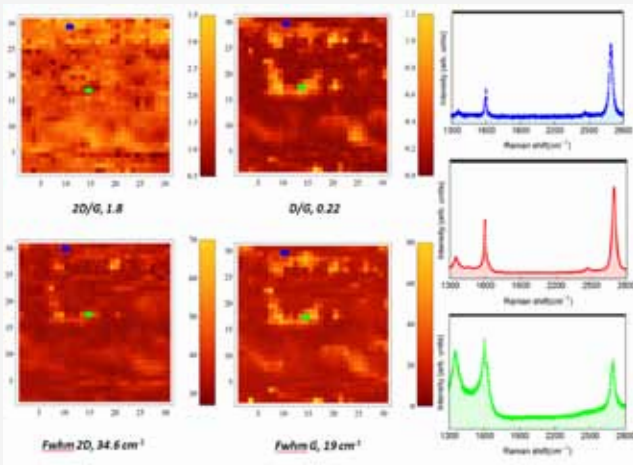


Homogeneous bilayer graphene is grown on both side of the copper foil

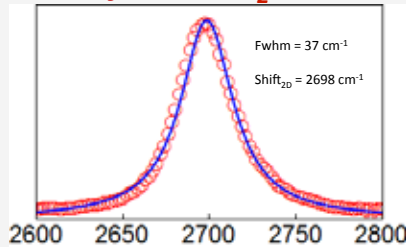
Characterization by Raman Spectroscopy



Characterization after transfer on SiO₂



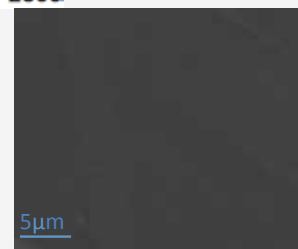
Raman maps of graphene after wet chemical transfer on SiO₂ using PMMA



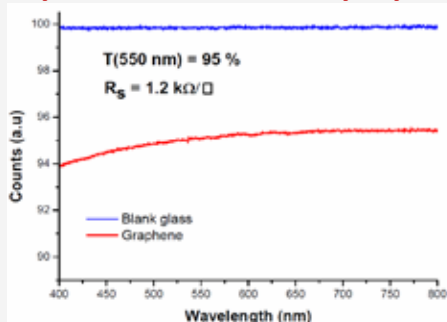
2D peak is fitted with **one Lorentzian peak**

Misoriented bilayer graphene

Scanning Electron Microscopy
 Polycrystalline graphene
 Grain size: 10-15 μm



Optical and electrical properties



Typical transmittance [2] and sheet resistance [3] of millimeter scale bilayer graphene grown by CVD.

Conclusion

We have successfully modified the ODH chemistry for the growth of bilayer graphene. The yield of reaction is 10^4 higher than to the reference synthesis using methane. Future development will aim at the reduction of the growth temperature as well as the in situ growth on oxides.

References

- [1] Magrez et al, ACS Nano 2010, 7, 3702-3708
- [2] Nair et al, Science 2008, 320, 1308
- [3] Bae et al, Nat. Nano. 2010, 5, 574-578