Nitrogen-Doped Graphene: Novel Growth and Plasma Doping

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Abstract (Arial 10)
We present a microwave plasma torch (MPT) method[1] which uses hydrocarbon gas source as precursor to synthesis grapheen sheets. Growing graphene experiments are carried out in an atmospheric-pressure microwave (2.45 GHz) plasma reactor (figure 1). Reaction gas mixture (Ar:CH4 = 2000:3 flow ratio) is introduced into the quartz tube. The Raman data (figure 2) and TEM image (figure 3) show the graphene sheets are less than three layers. Electron cyclotron resonance (ECR) system has higher plasma density and lower plasma potential which are suitable to do nitrogen plasma doping. Nitrogen plasma doping experiments are carried in 7 x 10^{-4} torr for 5 minutes without heating. XPS data (figure 4) shows the graphene sheets can achieve 8.1 at% of nitrogen easily.

References

[1] Albert Dato, Velimir Radmilovic, Zonghoon Lee, Jonathan Phillips, and Michael Frenklach, Nano Lett. 8, (2008) 2012.

Figures

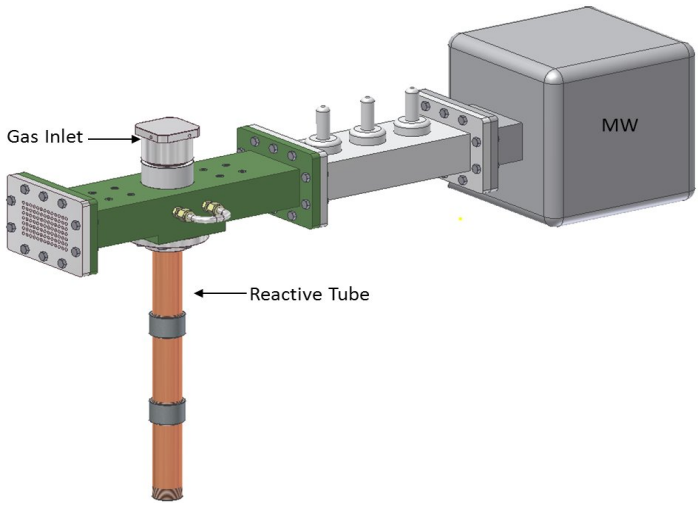

Figure 1. Schematic of the atmospheric-pressure microwave plasma reactor used to synthesize graphene.

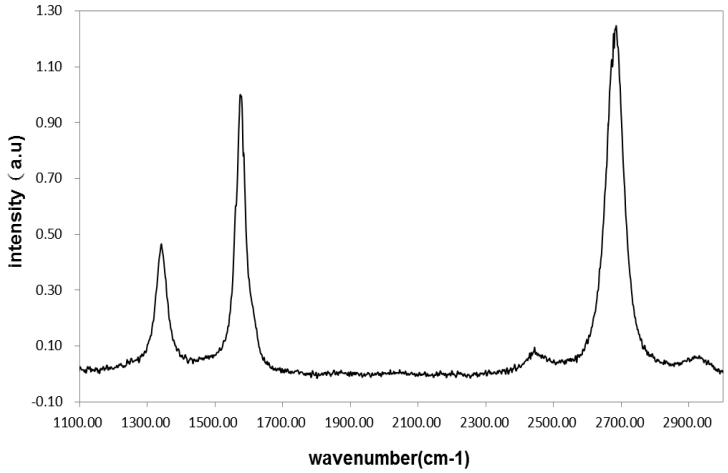

Figure 2. Raman spectroscopy characterization.

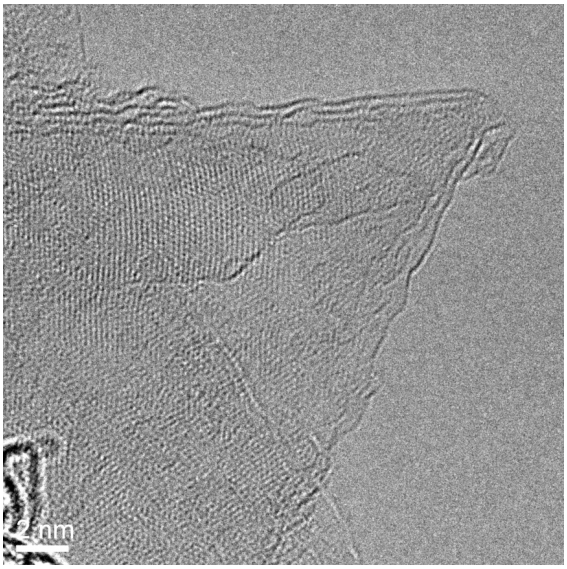

Figure 3. Typical TEM image of graphene sheet grown by MPT.

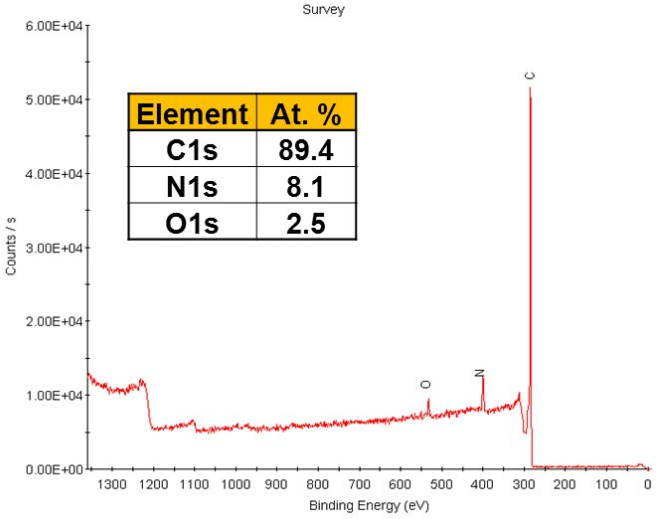

Figure 4. XPS survey for as-synthesized N-graphene sheet.