Onyx Graphene and 2D Materials Inspector

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Onyx is a turnkey, non-contact and non-destructive device for the inspection of several properties of graphene and other 2D materials. Onyx generates full-area maps of conductance, resistance, thickness and other parameters from materials such as graphene, GaN, PEDOT, ITO, NbC, ALD, spin coated photo-resins. The maps provide information about the homogeneity and quality. Similar characterization is currently realized by nano-scale methods, such as confocal Raman spectroscopy, Atomic Force Microscopy, or Transmission Electron Microscopy, and/or macro-scale methods [1], such as van der Pauw or optical microscopy. However, nano-scale methods are slow and cannot characterize large surfaces. Macro-scale methods generate characterization that average the magnitudes and, thus, cannot provide localized information.
Onyx provides meso-scale characterization and covers the gap between nano-scale and macro-scale methods. Onyx is a terahertz-based system [2] that works in reflection geometry as opposed to state-of-the-art methods [1-3] and provides conductance and resistance maps in the terahertz range.
Figure 1 shows the conductance maps of 3 CVD monolayer graphene samples, which were characterized using Raman and optical microscopy. Based on this characterization, samples A and B were determined as good and sample C as bad. Onyx shows that sample C is bad and sample B is good indeed. However, sample A is debatable. The average conductance value of A is similar to B but its homogeneity is very different. Onyx acquires data in less than 5 minutes while Raman characterization, which required 3 days to obtain a comparable measurement. The results are in excellent correlation with van-der Pauw method [4].
Onyx can be integrated with reactors and enable monitoring production in real-time. Therefore, Onyx could support the production of graphene at industrial scale. Onyx can implement characterization standardized protocols for accurate and repeatable measurements.

References

[1] Buron et al, *Nano Letters*, 12, 10 (2012), 5074
[2] Rouhi et al, *Nano Research*, 5, 10 (2012), 667
[3] Ellrich et al, IRMMW-THz, (2008)
[4] Buron et al, *Nano Letters*, 14, 10 (2014), 6348

Figures

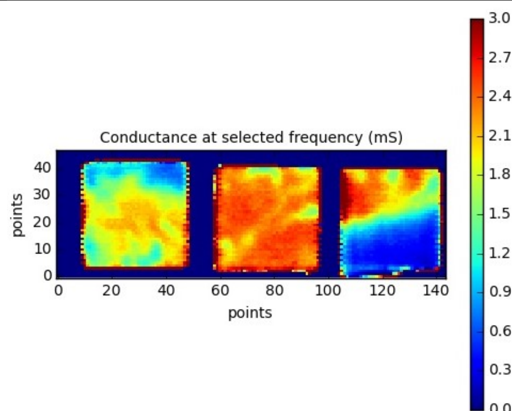

Figure 1: Conductance maps of three samples of CVD monolayer graphene at 0.5 THz.