Onyx, a new standard for 2D materials characterization

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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, TiN, GaN, PEDOT, ITO, NbC, ALD, spin coated photo-resins. The maps provide information about the homogeneity and quality. Similar characterization is currently done 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.

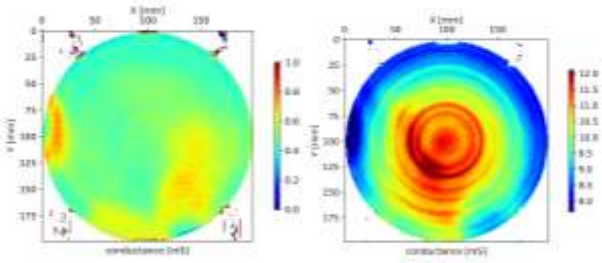
Figure 1 shows the conductance maps of two 8" wafer. Sample A shows the conductance of a bare Si wafer while sample B shows the conductance of a 8" Si wafer cover with a 40nm TiN film deposited by ALD. As it is possible to see, Onyx provides information about the conductance of the sample and the quality of the ALD deposition process. This analysis where performed in less than 1 hour and a full map of the samples where obtained. 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



(a) (b)

Figure 1: Conductance maps of two samples: (a) 8" Si wafer and (b) 40 nm TiN film over Si substrate at 0.5 THz.