FlexeGRAPH: Graphene and 2D Materials Production at The Australian National University

Shannon M. Notley

Research School of Physics and Engineering, The Australian National University, Canberra 2601 ACT Australia
graphene@anu.edu.au

Abstract

The Australian National University (ANU) holds a unique IP portfolio in the production of pristine graphene and other 2D material particles. At the heart of the technology, is the ability to control stabilization in water and non-aqueous solvents as well as the flexibility to improve compatibility with a range of materials such as thermosets and thermoplastics to enhance dispersion.
FlexeGRAPH [1] is the recently launched brand for 2D materials manufactured at ANU. It is produced via a scalable method resulting in graphene and other atomically thin particles ideally suited for use in many applications. The facile technique leads to large defect free particles with very low thickness (typically 90% less than 2nm) with high electrical and thermal conductivity. The production facility was commissioned in October 2015 with a capacity of 2 tonnes per year however this process is easily scaled to larger volumes. The process itself is non-toxic and environmentally friendly.
Supply certainty using the low cost in-house production facility coupled with the ability to control interfacial properties of the 2Ds has allowed us to focus on validating the use of graphene in downstream high volume applications centred on thermal management. This presentation will concentrate on the use of graphene and hexagonal-boron nitride to render inherently thermally insulating materials heat conducting. Our main areas of attention to date are:

- Phase change materials with high thermal conductivity for use in energy storage, transport and construction.
- Thermosets such as urethanes, acrylates, epoxies and benzoxazines tailored for applications including thermal interface materials and structural composites.
- Heat transfer fluids for solar thermal co-generation systems and coolants for engines.

We have used the laser flash technique (LFA) in order to determine the thermal properties of the diverse systems described above in addition to the extensive characterization of the raw 2D materials (Figure 1).

References

[1] https://www.graphene.anu.edu.au

Figures

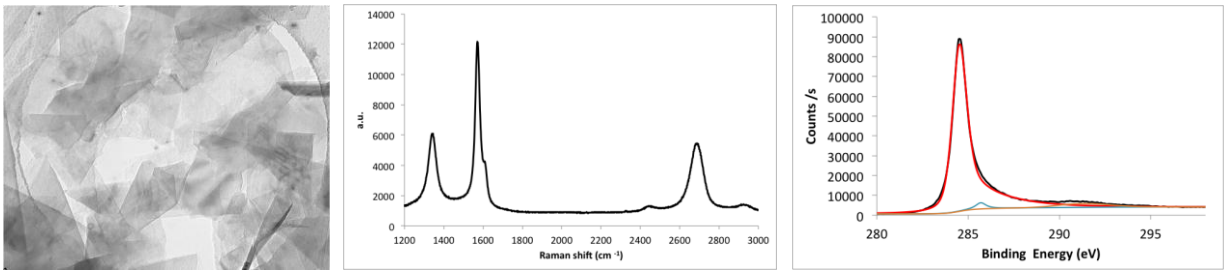

Figure 1. Left: TEM image of FlexeGRAPH graphene (image scale 1 μm across). Middle: Raman Spectrum of FlexeGRAPH graphene. Right: XPS C1s peak of FlexeGRAPH graphene with a C:O of 60:1.