

**Barry Brennan<sup>1</sup>**Philipp Braeuninger-Weimer<sup>2</sup>, Stephan Hofmann<sup>2</sup>, Andrew J Pollard<sup>1</sup><sup>1</sup>National Physical Laboratory, Hampton Road, Teddington, TW11 0LW, UK<sup>2</sup>Department of Engineering, University of Cambridge, Cambridge CB3 0FA, UK

barry.brennan@npl.co.uk

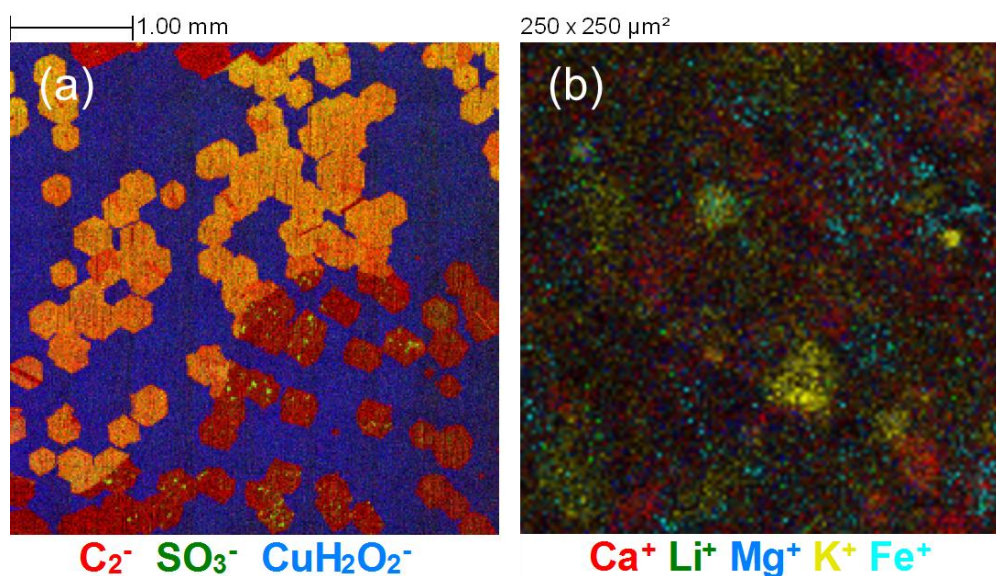
## How Clean is My Graphene?: Understanding the Impact of Contamination Using ToF-SIMS Characterization

Due to the extensive research carried out on graphene and related 2D materials over recent years, the fundamental physical and electrical properties are generally well understood, however uptake by industry is still at a relatively low level. One of the major barriers to this has been a lack of consistency in the properties of commercial scale materials, whether that is in exfoliated graphene powders or chemical vapour deposition (CVD) grown 2D layers on metal catalysts. One major reason for this is likely to be the significant variations in chemistry and contamination which can be observed for these materials[1]. Sample handling, processing, and even inherent variations in source materials can lead to measureable differences between samples. In this study, we use Time of Flight Secondary Ion Mass Spectrometry (ToF-SIMS), a highly surface sensitive measurement technique, to explore in detail the variation in contamination species present with different graphene material systems, and show how this can impact on graphene composite material properties [2], and CVD growth mechanisms [3], where contamination can be directly linked to changes in nucleation densities.

### References

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- [2] B. Brennan, S. J. Spencer, N.A. Belsey, T. Faris, H. Cronin, S.R.P. Silva, T. Sainsbury, I.S. Gilmore, Z. Stoeva, A.J. Pollard, Applied Surface Science, 403, (2017) 403.
- [3] P. Braeuninger-Weimer, B. Brennan, A.J. Pollard, S. Hofmann, Chemistry of Materials, 28 (2016) 8905.

### Figures



**Figure 1:** ToF-SIMS images of (a) CVD single crystal graphene grown on copper foil, and (b) pressed exfoliated graphene powder, showing the presence of various contaminant species associated with each sample.