- **A chemistry innovation business** supplying differentiated technically advanced specialty products

- **Current product portfolio** functional derivatives of copper, tin, iodine

- **Actively developing advanced materials** such as graphene oxide, tungsten products, and perovskites
Core Capabilities - Graphene Oxide

William Blythe has a wealth of experience and capabilities which have been applied to the development of GO

- Key raw materials (strong acids, oxidising agents) are within William Blythe core capabilities
- William Blythe are experts in redox chemistry
- William Blythe have expertise in controlling and measuring the physical properties of powders
- Well developed Process Safety Management System to allow the safe scale up of hazardous processes and a top tier COMAH site allows use of hazardous chemicals
Improving Material Properties with Graphene Oxide

- Improved stiffness, increased mechanical-temperature resistance, improved thermal stability, decreased peak heat release in Polystyrene with blended GO

- Decreased electrical conductivity degradation with temperature in composites

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**FIG. 2.** (a) Electrical conductivity ($\sigma$) of RGO/PS composites with different RGO concentrations ($\phi$) at 300 K (inset, $\ln(\sigma)$ vs. $\ln(\phi - \phi_c)$). (b) Temperature-dependent electrical conductivity ($\ln(\sigma)$ vs. $1/T^{1/2}$) at various RGO concentrations (inset, $T_0$ vs. $\phi$).
Improving Material Properties with Graphene Oxide

- Improved membrane performance

- Other applications including solar cells, graphene/polymer composite materials, batteries, supercapacitors, support for metallic catalysts, low permeability materials, biosensors, and multifunctional materials

1 Han, Wu, J. Material Science, 22 February 2013
Challenges

- Variation in materials sold on the marketplace under the name “graphene oxide”
  - Leads to some instances of potential users claiming it doesn’t work in their application when it may have benefits if a different grade was used
  - Difficult for users to compare prices between suppliers

- Concern over health effects
  - Some potential customers will not consider using nanomaterials in their research until there is conclusive data on the effects to human health
  - Cost of generating the required data is high, until graphene oxide is in high enough demand, difficult to justify costs

- Industry awareness of graphene oxide is a limiting factor
  - Range of applications GO can be used in is wide, without considering functionalised GO, but often not considered in R&D because its use is still academic
  - Cost in use can be an issue – potential users don’t realise how low loading could be
  - Potential users might not have any interest yet because they aren’t aware that GO is tuneable and available at commercially relevant quantities and prices