Tomorrow’s Material. Today.

Advanced Engineering Show 2019

31/10/19  N A Blatherwick – Commercial Director

Graphene in a Commercial Automotive Paint Primer
Applied Graphene Materials

- “Bottom-up synthesis technology” for continuous and consistent manufacturing.
- Leading production ready Genable® dispersion range
- Focus on:
  - **Paints and Coatings** – Outstanding performance gains for barrier and anti-corrosion.
  - **Polymer Composites** – Enhanced interlaminar toughness, strength and fatigue performance.

**Ultimate cost reduction is the drive behind vast majority of developments**
Graphene Manufacturing Routes

Graphite

Top Down
• Mechanical or chemical exfoliation of Graphite

Bottom Up Synthesis
• Graphene produced by molecular growth from small molecular carbon precursors
• Number of layers controlled using different substrate catalysts and growing/reaction parameters
• Gives large surface area and high purity
AGM Graphene Nanoplatelets – Product Properties

- Very thin, crumpled sheets, 5-15 atomic layers
- Very low density and high surface area, enabling very low loadings.
- AGM expertise to develop and scale up “production ready” dispersion
- Very low addition by % weight .....
**Genable® Product Range Overview**

**Genable® 1000 series**
- Additives to enhance barrier / anti-corrosion, especially in synergy with existing active ingredients

**Genable® 1200 series**
- Cost effective additives to enhance barrier / anti-corrosion performance at very low loading

**Genable® 2000 series**
- Delivers outstanding active anti-corrosion performance on aluminium substrates

**Genable® 3000 series**
- Active, non-metallic, anti-corrosion additives with industry leading performance
James Briggs Ltd

- Founded in Manchester in 1830
- Employ more than 250 people in the Manchester area
- Manufacturing aerosol products since 1972
- Producing 60m aerosols / 10m litres liquid fill p.a. on 2 sites
- Offer a fully integrated service; technical (laboratory & analytical), regulatory, design, manufacture and delivery
- Portfolio of over 16,000 product formulations in our IP library

- 12 aerosol lines and 7 liquid fill lines
- Markets: Automotive, Industrial, Hygiene, Decorative, Craft & Game
- A number of house brands, including market sector leaders Hycote and Nilco
- 120+ Private Label customers including household and High St names
- ISO 9001, ISO 14001, OHSAS 18001 accredited
- Sales and Technology lead business
- Market leading quality and lead times
- Innovation is key

www.appliedgraphenematerials.com
AGM’s Strategy – Collaboration is the key to successful early adoption

- Proprietary ‘bottom-up’ synthesis of high specification graphene
- Fully scalable, cost effective manufacturing
- Dispersion and product integration expertise
- Partnerships for application development
Automotive Spray Primer Development - Objectives

Improve existing primer paint for automotive repair applications.

Current system an industry standard vinyl/acrylic based paint with good anticorrosion performance.

Applications are typically single coat with low film thicknesses.

Key Target Benefits:

• Significantly improve corrosion performance
• No impacting on other physical properties
• Ensure the paint remains economically viable for the repair market, both trade and retail
Graphene within anticorrosive coatings?

• Mechanisms proposed in literature
  – physicochemical process (restricting uptake of water/oxygen and salts).
  – electrochemical activity (conductivity dependent on Graphene type and loading level)

• Materials like glass flake/micas historically used as barrier pigments to provide a tortuous path in anticorrosion primers.

• Graphene offers an economically viable step change delivering:
  – High surface area
  – Extremely low density
  – Performance gains without the negatives
Graphene Anti-Corrosion Primer

Salt Spray Testing - after 168 Hours

Control

Graphene Based

Prohesion Testing
ASTMG85 annex 5
Graphene Anti-Corrosion Primer

- Salt Spray Testing - after 432 Hours

Prohesion Testing
ASTMG85 annex 5
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**Salt Spray Testing - after 1000 Hours**

**Prohesion Testing**
ASTMG85 annex 5
Graphene Anti-Corrosion Primer

- Salt Spray Testing - after 2000 Hours

Control

Graphene Based

Prohesion Testing
ASTM G85 annex 5
Graphene Anti-Corrosion Primer

• Salt Spray Testing - after 3000 Hours

Control

Graphene Based

Prohesion Testing
ASTMG85 annex 5
Graphene Anti-Corrosion Primer

- Exceptional corrosion protection
- Zinc Free – Less environmentally hazardous vs conventional anti-corrosive primers.
- Excellent barrier properties to dramatically extend coating life.
- Extremely fast drying – Touch dry in 3-4 minutes, sand and topcoat after 20 minutes.
- Excellent adhesion to metallic surfaces – Mild Steel, Aluminium, Zintec.
- Excellent Flexibility – ASTM D522 Conical Mandrel - No cracking.
- Excellent anti-sag properties enable high coat depths to be achieved.
- Fills minor surface imperfections.
- Smooth matt finish with excellent sanding properties.
- Can also be applied to many rigid plastics
Graphene in products used by everybody, everyday