HYDROGRAPH

IGNITING MATERIAL CHANGE

FRACTAL GRAPHENE™

IN CONSUMER PACKAGING

Material OVERVIEW

Fractal Graphene transforms consumer packaging by delivering exceptional performance improvements with enhanced strength and barrier properties, allowing for packaging that uses less material, helping to achieve continual cost reduction, while meeting regulatory requirements for increased recycled content and reduced environmental impact. When incorporated into PET bottles for example, our pristine Fractal Graphene achieves remarkable enhancements with concentrations as low as 0.0015 wt%, making it the most cost-effective solution for next-generation sustainable packaging. As the packaging industry faces mounting pressure from extended producer responsibility legislation worldwide, Fractal Graphene enables manufacturers to stay one step ahead.

Loading Efficiency

Only 0.0015 wt% Fractal Graphene delivers transformational packaging performance improving strength and barrier properties - enabling up to 20% weight reduction. Conventional Graphene Nanoplatelets require at least 10x higher loading rates.

Applications

- Beverage Bottles
- Food Containers
- Personal Care Bottles
- Flexible Packaging
- Rigid Packaging

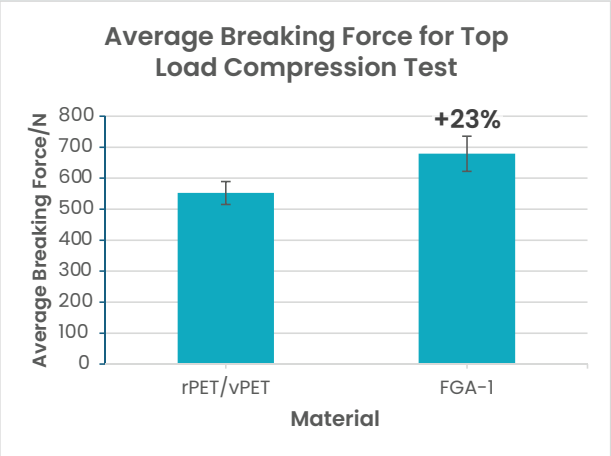
Manufacturing

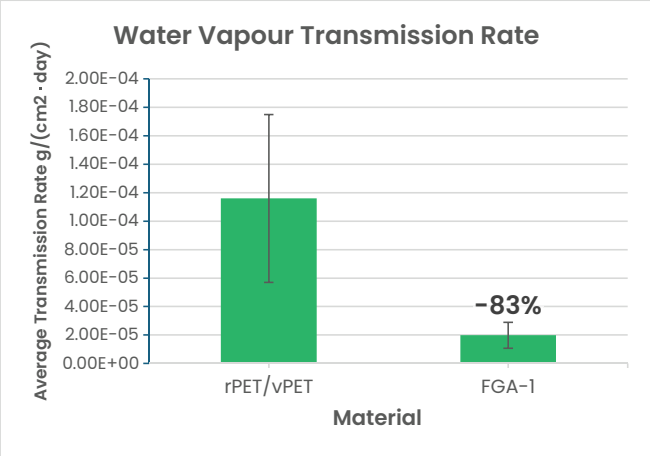
- Injection Stretch Blow Molding
- Extrusion Blow Molding
- Injection Molding
- Film Extrusion
- Thermoforming
- Sheet Extrusion

Polymers

Applicable for PET (Polyethylene Terephthalate), PE (Polyethylene), PP (Polypropylene), and other polymers used in consumer packaging.

Fractal Graphene Enhancement





Charts: Breakthrough performance improvements in PET bottles with 0.0015 wt% FGA-1

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HydroGraph Products

Fractal Graphene

Pristine turbostratic graphene of unsurpassed purity, identical batch-to-batch consistency and lowest environmental footprint.

- Pristine carbon structure (100% sp^2 hybridized)
- 99.8% carbon, 0.2% oxygen with no PAHs
- Thickness: 2-3 nm (average 6 graphene layers)
- Lateral dimensions: 20-50 nm
- Bulk mass density: 70-100 mg/cc
- BET specific surface area: 200 m^2/g
- Composed of fractal aggregates of monomers (primary particles)
- Very dark, black, hydrophobic powder

Reactive Graphene

Functionalized turbostratic graphene featuring precise functional chemistry, identical batch-to-batch consistency and the lowest environmental footprint.

- Surface decorated with carboxylic acid (-COOH) functional groups
- 96.3% carbon, 2.1% oxygen, 1.6% hydrogen, no PAHs
- Thickness: 2-3 nm (average 6 graphene layers)
- Lateral dimensions: 10-50 nm
- BET specific surface area: 165 m^2/g
- Composed of fractal aggregates of monomers (primary particles)
- Dark, black, hydrophilic powder

HydroGraph Advantage

Superior Quality

Highest purity graphene material in the market, exceptional particle size uniformity, identical batch-to-batch consistency, for unbeatable quality and reliability.

Ultra-low Addition Rates

Achieves exceptional performance at concentrations 10-100x lower than conventional graphene nanoplatelets, fundamentally transforming the economics for graphene technology.

Sustainable Advantage

Improves resource efficiency, reduces GHG emissions, inherently lowest energy footprint and carbon footprint graphene available.

The Fractal Future

The fractal structure—unique to HydroGraph's graphene—provides performance advantages that cannot be replicated by conventional graphenes. As industries increasingly seek sustainability by doing more with less, Fractal Graphene™ stands ready to transform the way products are formulated and manufactured.

Contact HydroGraph today to learn how Fractal Graphene™ can enhance your products and processes.

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