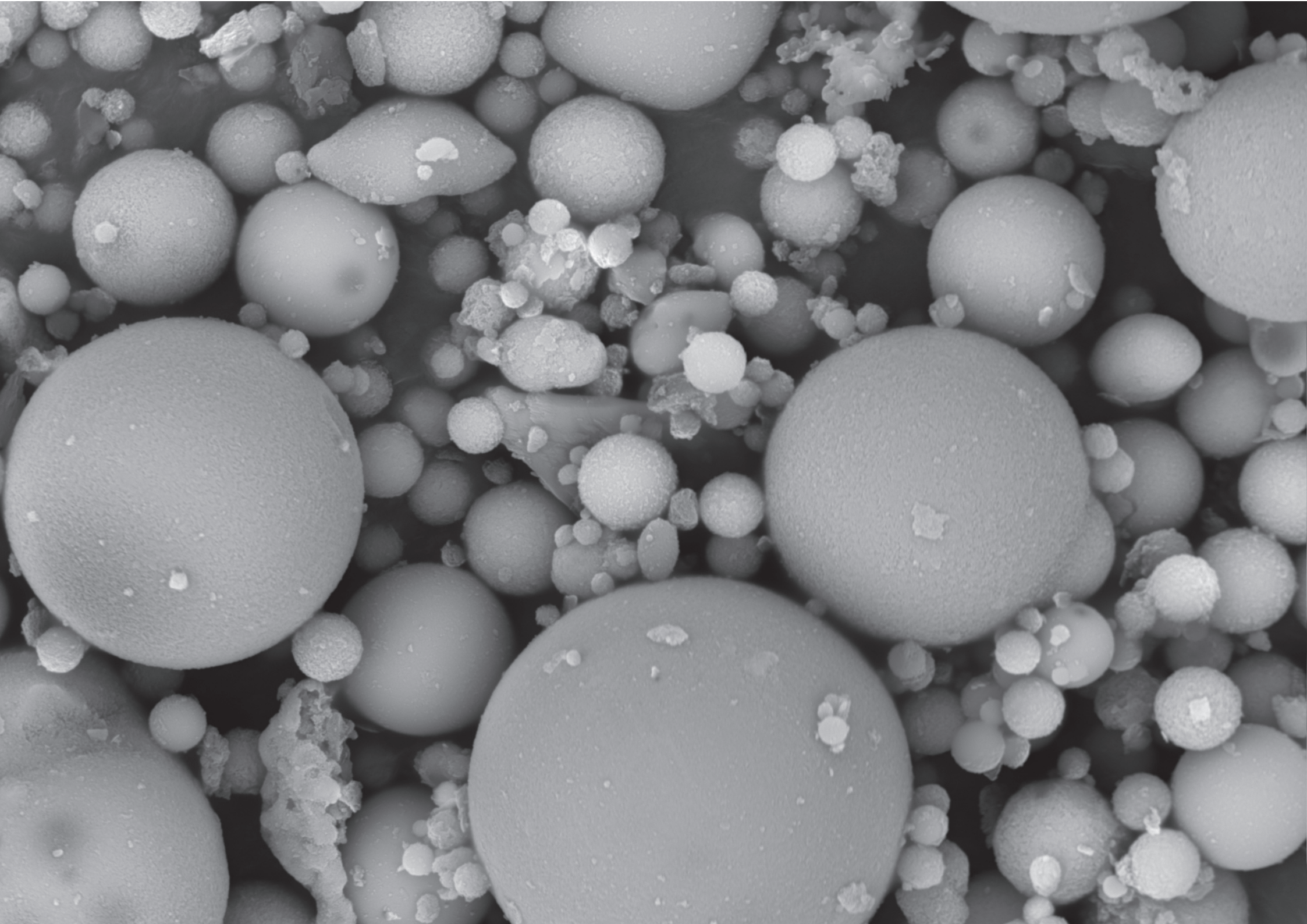


# RockTron

Advanced Products

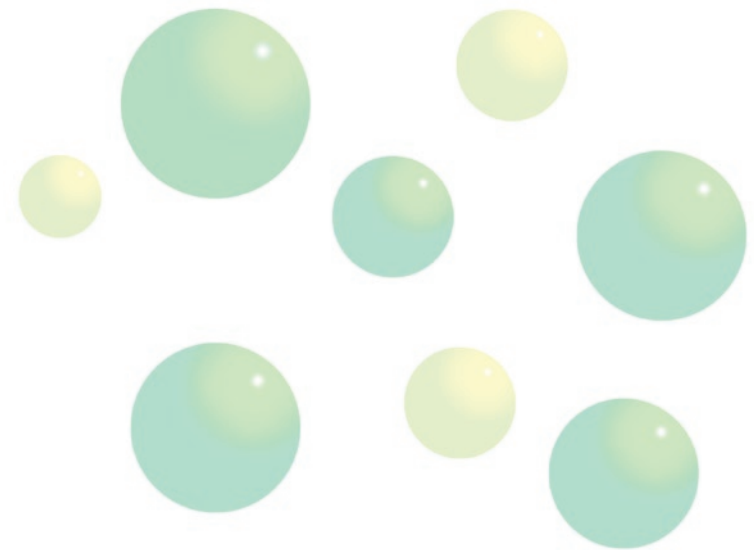
POWERFULLY GOOD ECO-MINERALS





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“Our 100% recycled eco-minerals will cut manufacturing costs, increase margins and green supply chains.”

Simon Smith

*Chief Executive of RockTron*



## RockTron

RockTron is a world leader in innovative recycling technology, transforming coal-fired power station fly ash from a waste into valuable eco-mineral fillers and extenders on an industrial scale, with no waste stream.

With “RockTron Inside”, manufacturers can cut production costs, increase margins and improve profitability, while simultaneously greening their supply chain. RockTron’s products can bring a wide range of important benefits through lower energy usage or higher loadings, or as a result of the replacement of more expensive minerals. These benefits depend on the polymer, application and materials currently being used; whether flexible or rigid, thermoplastic or thermosetting.

Our unique proprietary process offers manufacturers new and enhanced application opportunities with our wide range of 100% recycled Advanced Products, which includes hollow and solid alumino-silicate microspheres (<1 to 300 micron) and solid paramagnetic microspheres, designed to replace conventional and man-made inorganic fillers and extenders such as talc, GCC, glass fibres, glass microspheres, barytes, dolomite, clay et al. RockTron’s products possess a number of fundamental advantages: being spherical; relatively hard; and free flowing. Furthermore, our beneficiation process removes any residual surface alkali salts to enhance product performance.

Our new UK plant is located at Fiddler’s Ferry, near Widnes in Cheshire and can produce 800,000 tonnes of eco-minerals p.a. Our unique technology is designed to process both fresh AND stockpiled fly ash, so that production is unaffected by seasonality. RockTron is growing internationally with plans to build plants in Asia, the US and Europe.



# Advanced Products Range

RockTron's new Advanced Products help plastics, rubber and coating manufacturers cut their costs by substituting RockTron Advanced Products for their current fillers. All our products are spherical in shape, give superior or comparable performance and consistent quality. They have lower Specific Gravity and oil (resin) absorption compared with many other inorganic fillers. Furthermore, due to their spherical shape, there is potential for increased extruder and compounding production and lower energy consumption.

**MinTron™:** A range of micron-sized classified spherical alumino-silicate products for use as fillers and extenders in coatings, plastics, rubber and hi-tech industries.

**CenTron™:** A range of classified cenosphere products (hollow alumino-silicate microspheres) for use in a wide range of applications including lightweight fillers and coatings.

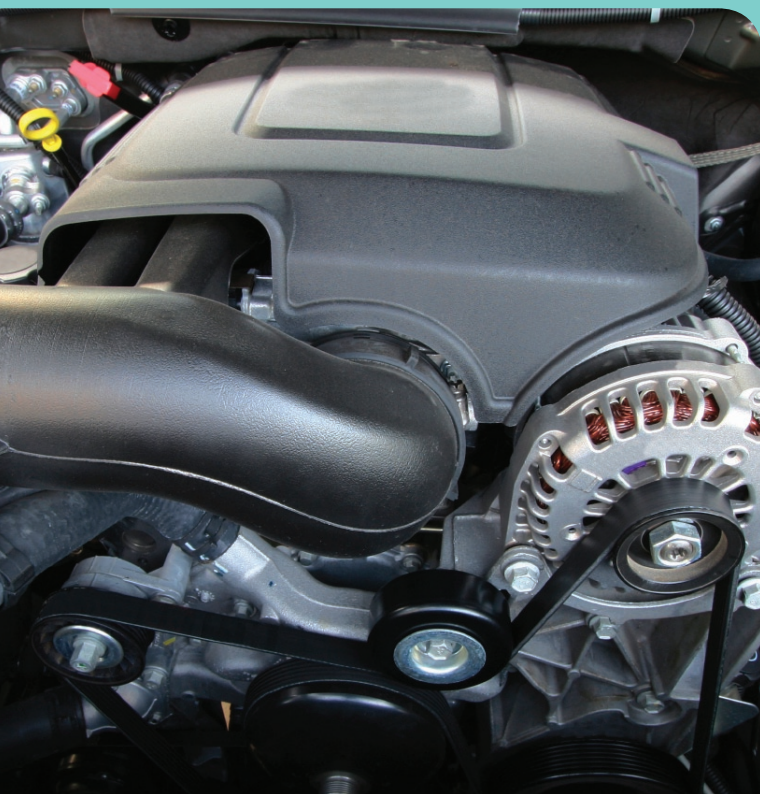
**MagTron™:** A range of unique micron-sized, spherical-shaped paramagnetic particles for use in sound absorption applications and Electro Magnetic Interference / Radio Frequency Interference (EMI / RFI) materials.

## Environmental Benefits

We offer a sustainable supply of 100% recycled materials with a lower embodied CO<sub>2</sub> in an environmentally friendly product range you can substitute without paying a premium or compromising on performance.

Our unique process does not require the usual mining and milling processes employed in mineral production, thus reducing energy consumption and CO<sub>2</sub> emissions. In fact, the RockTron plant returns more energy than it consumes, by recovering the coke (coal without volatiles) for reuse in the power station.

So by using RockTron's Advanced Products, you can improve product and manufacturing performance, reduce your costs and automatically green your supply chain.



# MinTron™

MinTron™ can be applied to most industries including polymers, coatings, aviation, cabling, piping, medical and domestic appliances. For example, our MinTron™ products are of growing interest to the automotive industry, who are under increasing pressure from their environmental performance goals to cut vehicle weight, and therefore CO<sub>2</sub> emissions and increase the percentage of recycled material used in car manufacturing (e.g. under bonnet, interior and exterior components and in tyres).

RockTron's MinTron™ products can also be coated with RockTron Biocide, a microbicide / fungicide, which is certified to control a vast range of bacteria such as MRSA, clostridium difficile and fungi. A range of applications is envisaged in areas where high levels of hygiene are required such as flooring in hospitals, care homes, sports facilities and schools.

- Solid alumino-silicate glass spheres
- Particle size range <math>1\mu\text{m}</math> - - Good chemical resistance
- Particle density 2.0 - 2.3 g/cc
- Free flowing, hard and smooth
- Spherical shape
- Low oil (resin) absorption
- Disperses evenly
- Lowers surface to volume ratio
- Hardness: Mohs scale 5 - 6
- Low carbon footprint (0.07 - 0.08 kg CO<sub>2</sub> / kg product).



# MinTron™

## Product Performance

Independent research by ARTIS (Avon Rubber Technology Innovation and Science) and Queens University Belfast (Polymer Processing Centre) has yielded promising results regarding performance in rubbers and polymers, with substitution capabilities as high as 40%.

In rubbers, positive test results have been achieved by partially replacing precipitated silica in passenger tyre treads and carbon black in butyl inner tyre liners, offering potential cost reduction and performance benefits.

In thermoplastics, excellent results in scratch test performance have been observed, offering potential cost and weight reduction, with superior performance compared to softer minerals.

MinTron™ 7 can be coated with a specific coupling agent adapted to each polymer family. This coating ensures an optimal bonding between the glass spheres and the resin.

### **Product range:**

MinTron™ 70 **Solid Glass Spheres**

MinTron™ 7 **Solid Glass Spheres**

MinTron™ 7 SC1 **Coated (PA, PBT etc.)**

MinTron™ 7 SC2 **Coated (PP, PE etc.)**

MinTron™ 7 SC3 **Coated (Thermosets)**

MinTron™ 7 TR **Passenger Tyres**

MinTron™ RTB **Biocide Coated**



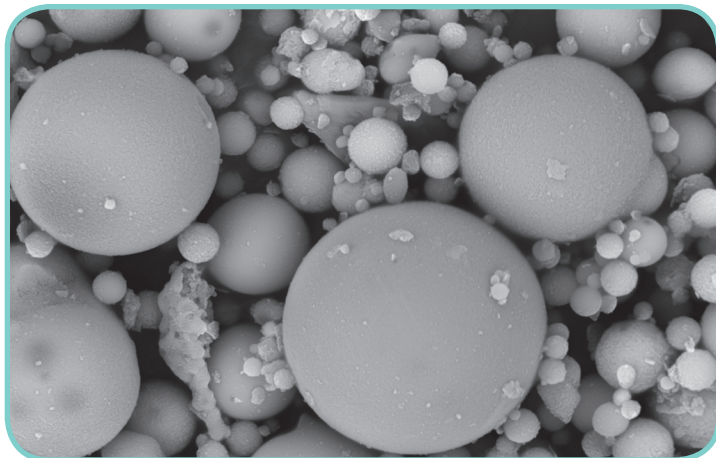
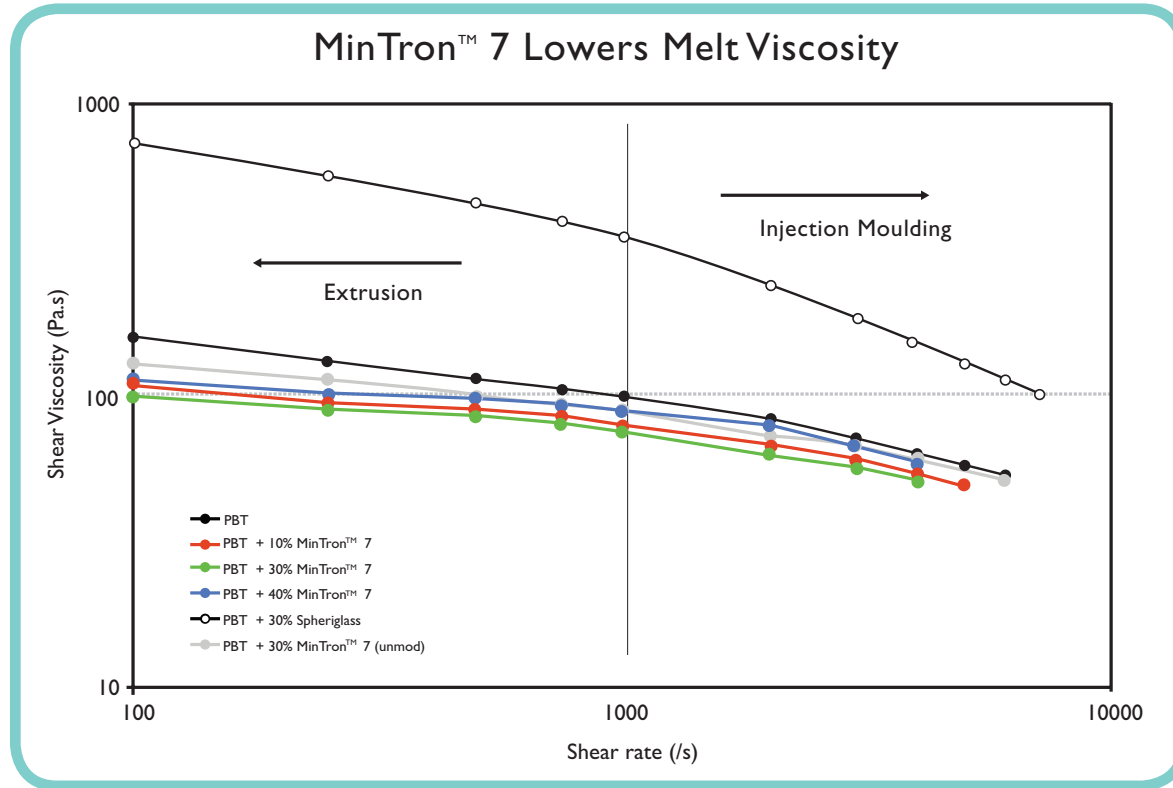
# MinTron™ Product Specification

|                | Product Description                                       | Median Particle Size | Bulk Density | Hydrostatic Crush Strength MPa (PSI) | Particle Density Range      | Oil Absorption BSEN ISO 787 – 5: 1995 | Moisture Content |
|----------------|---|----------------------|--------------|--------------------------------------|-----------------------------|---------------------------------------|------------------|
| MinTron™ 7     | Solid spherical alumino-silicates                         | 5 - 9 µm             | 0.8 - 1.1    | > 200 (30,000)                       | 2.3 - 2.4 g/cm <sup>3</sup> | 35.7 ml/100g                          | <0.5%            |
| MinTron™ 7 SC1 | Solid spherical alumino-silicates plus functional coating | 5 - 9 µm             | 0.8 - 1.1    | > 200 (30,000)                       | 2.3 - 2.4 g/cm <sup>3</sup> | <35.7 ml/100g                         | <0.5%            |
| MinTron™ 7 SC2 | Solid spherical alumino-silicates plus functional coating | 5 - 9 µm             | 0.8 - 1.1    | > 200 (30,000)                       | 2.3 - 2.4 g/cm <sup>3</sup> | <35.7 ml/100g                         | <0.5%            |
| MinTron™ 7 SC3 | Solid spherical alumino-silicates plus functional coating | 5 - 9 µm             | 0.8 - 1.1    | > 200 (30,000)                       | 2.3 - 2.4 g/cm <sup>3</sup> | <35.7ml/100g                          | <0.5%            |
| MinTron™ 7 TR  | Solid spherical alumino-silicates for tyre applications   | 5 - 9 µm             | 0.8 - 1.1    | > 200 (30,000)                       | 2.3 - 2.4 g/cm <sup>3</sup> | <35.7 ml/100g                         | <0.5%            |
| MinTron™ 70    | Solid spherical alumino-silicates                         | 60 - 80 µm           | 0.8 - 1.1    | n/a                                  | 1.9 - 2.1 g/cm <sup>3</sup> | n/a                                   | <0.5%            |
| MinTron™ RTB   | Solid spherical alumino-silicates plus biocide coating    | 5 - 9 µm             | 0.8 - 1.1    | > 200 (30,000)                       | 2.3 - 2.4 g/cm <sup>3</sup> | <35.7 ml/100g                         | <0.5%            |



This graph shows the effect on melt viscosity when adding various levels of MinTron™7 to Polybutylene Teraphalate (PBT) at both injection moulding and extrusion rates of shear.

It can be seen that even at a filler loading of 40% MinTron™7, the melt viscosity is lower than the unfilled polymer.



MinTron™ - Solid Glass Spheres



# CenTron™

Due to their low weight and low thermal conductivity, these hollow glass microspheres are used in products requiring density, cost and noise reduction and improved stiffness, such as marine decks, aerospace and high-speed locomotive applications.

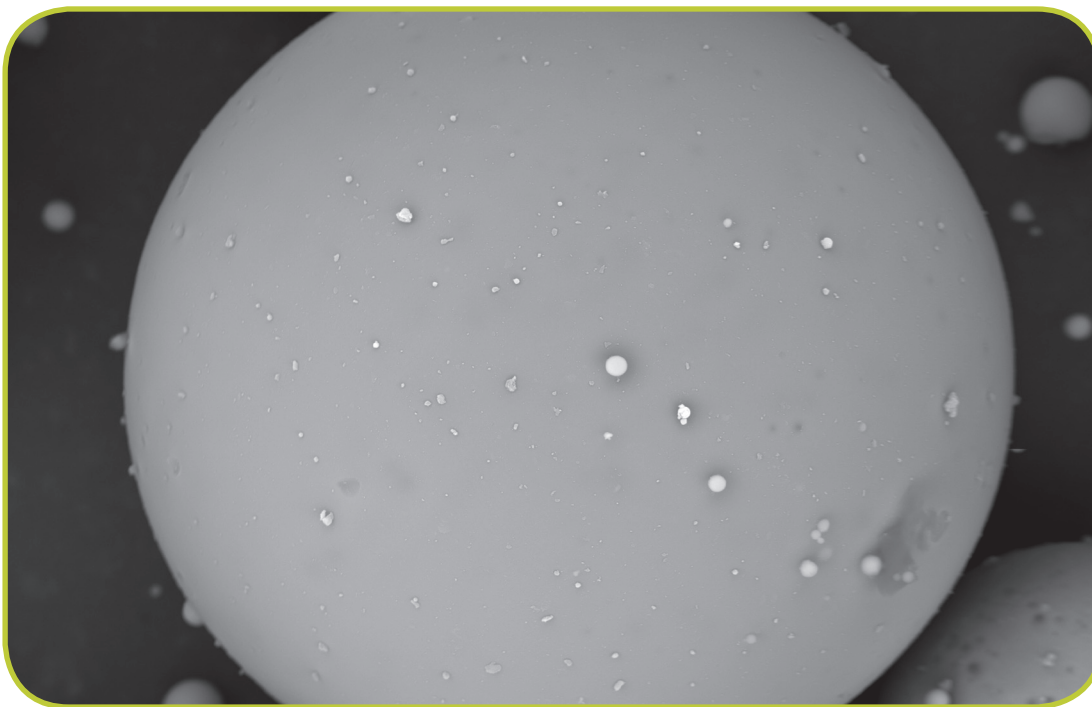
They are frequently used in the manufacture of buoyancy modules and thermal insulation materials for offshore oil and gas industry applications. They are also used in a wide range of applications including lightweight fillers and coatings.

- Hollow alumino-silicate glass spheres
- Particle density 0.6 - 0.8 g/cm<sup>3</sup>
- Bulk density 0.3 - 0.5 g/cm<sup>3</sup>
- Particle size range 1 - 300 μm
- Chemically inert
- High melting point (1200 - 1400 °C)
- Low thermal conductivity (0.1 - 0.2 Wm<sup>-1</sup> K<sup>-1</sup>)
- Low oil (resin) absorption
- Hardness (Mohs scale 5 - 6)
- Low dielectric constant ~2
- Low carbon footprint (0.07 - 0.08 kg CO<sub>2</sub> / kg product).

# CenTron™

## Product Specification

|          | Product Description                   | Particle Size | Bulk Density                | Hydrostatic Crush Strength<br>MPa (PSI) | Particle Density Range       | Moisture Content |
|----------|---------------------------------------|---------------|-----------------------------|---|------------------------------|------------------|
| CenTron™ | Hollow alumino-silicate glass spheres | 1 - 300 µm    | 0.3 - 0.5 g/cm <sup>3</sup> | 10 - 20<br>(1500 - 3000)                | 0.6 - 0.85 g/cm <sup>3</sup> | <0.5%            |



CenTron™ - Hollow Glass Spheres



# MagTron™

Due to its unique physical properties, these dense spherical paramagnetic particles can be used for a wide range of applications such as sound-deadening insulation, components in automotive and public transport and Electro Magnetic Interference / Radio Frequency Interference (EMI / RFI) shielding in electronic applications.

- New spherical magnetite
- Particle density 3.5 - 3.6 g/cm<sup>3</sup>
- Particle size range <1 μm - 100 μm
- Colour: black
- Paramagnetic
- Low carbon footprint (0.07 - 0.08 kg CO<sub>2</sub> / kg product).

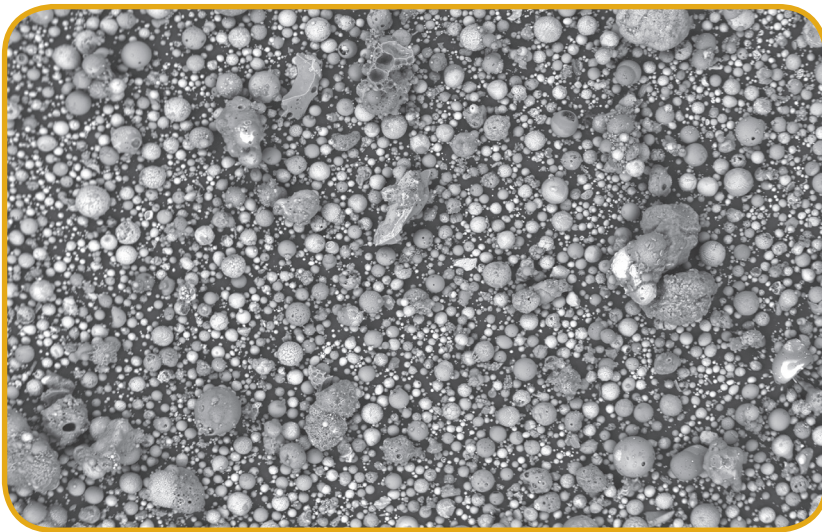




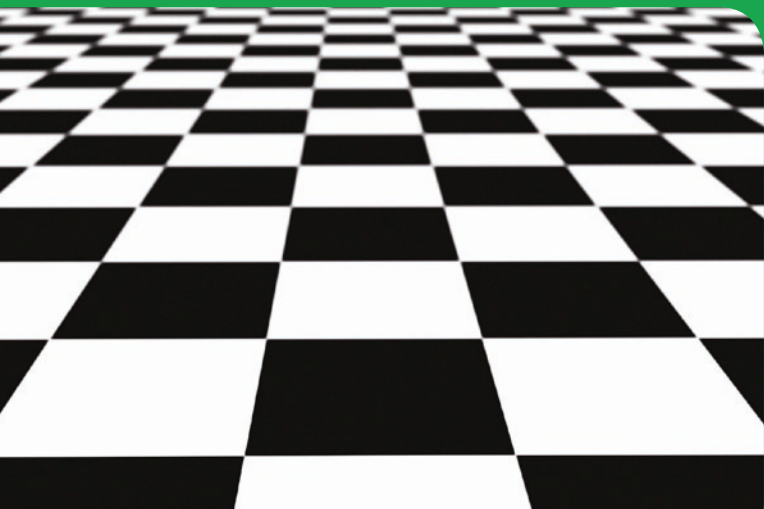
# MagTron™

## Product Specification

|             | Product Description             | Median Particle Size | Bulk Density                          | Particle Density Range      | Moisture Content |
|-------------|---------------------------------|----------------------|---------------------------------------|-----------------------------|------------------|
| MagTron™ 7  | Spherical Magnetite / Maghemite | 7 µm                 | Typically 1.7 - 1.8 g/cm <sup>3</sup> | 3.4 - 3.6 g/cm <sup>3</sup> | <0.5%            |
| MagTron™ 10 | Spherical Magnetite / Maghemite | 10 µm                | Typically 1.7 - 1.8 g/cm <sup>3</sup> | 3.4 - 3.6 g/cm <sup>3</sup> | <0.5%            |
| MagTron™ 70 | Spherical Magnetite / Maghemite | 65 µm                | Typically 1.7 - 1.8 g/cm <sup>3</sup> | 3.4 - 3.6 g/cm <sup>3</sup> | <0.5%            |



MagTron™ - Spherical Magnetite



# Advanced Products Benefits

RockTron Advanced Products have none of the usual mining, excavation, crushing, processing or energy costs associated with the manufacture of other inorganic fillers and extenders. Our unique process resolves many of the issues traditionally associated with fly ash recycling and the use of non-beneficiated material, namely seasonal disruptions and variable quality. Furthermore, following extensive testing, no safety concerns have been identified regarding the use of RockTron's Advanced Products as fillers and extenders in polymers, rubbers and coatings.

| Feature                     | Benefits   |
|-----------------------------|--|
| Spherical shape             | Reduces melt viscosity<br>Disperses evenly<br>Increases packing density<br>Potential increase in output<br>Potential lower process energy<br>Lower surface to volume ratio |
| Low particle density        | Reduces weight<br>Increases volume per kg  |
| Alumino-silicate glass      | Good chemical resistance   |
| Low oil (resin) absorption  | Reduces resin requirement  |
| Mohs hardness scale = 5 - 6 | Excellent scratch / wear resistance  |
| 100% recycled               | Low carbon footprint<br>Greens supply chain  |

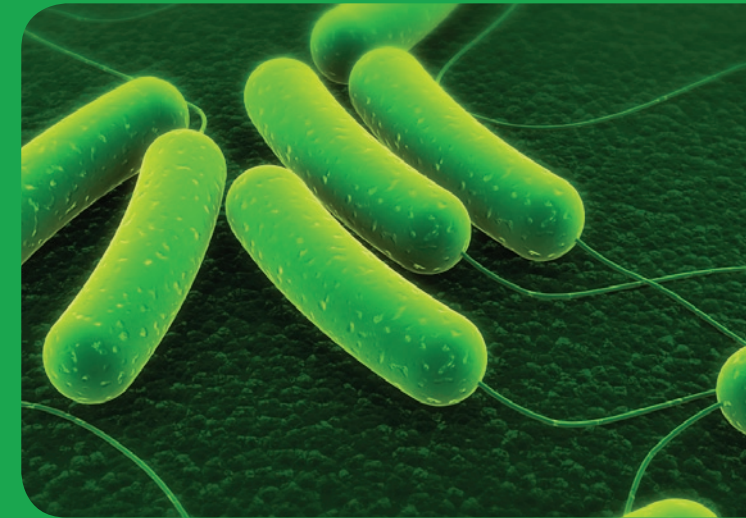


# Applications

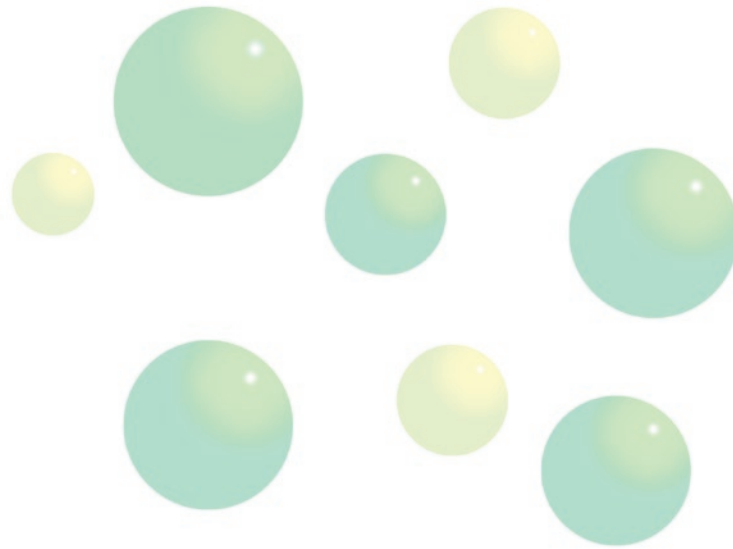
RockTron Advanced Products offer a wealth of exciting new industrial applications, serving as functional fillers in plastics, rubber and coatings, giving improved physical properties including sound absorption, Electro Magnetic Interference / Radio Frequency Interference (EMI / RFI) shielding and improved wear and scratch resistance for manufactured components. They can also be coated to change their surface chemistry for use in paints and coatings, flooring, plastics, elastomers, thermoplastics, thermosets, tyre manufacturing and electronics.

Specific industry applications include:

- Automotive (under bonnet, interior and exterior components)
- Tyres
- Aviation
- Cabling
- Marine decks
- Aerospace
- High-speed locomotives
- Piping
- Medical
- Industrial coatings
- Computers
- Domestic appliances
- Biocide protection.







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POWERFULLY GOOD ECO-MINERALS



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