Grupo Antolin Carbon Nanofibres (GANFs) are s-VGCF, (sub-micron Vapour Grown Carbon Fibres) with very small diameter, excellent aspect ratio and highly graphitic structure (graphitization degree about 70%). They are characterised by outstanding mechanical and transport properties (exceptionally high electric and thermal conductivity). Owing to their very small diameter and high aspect ration, GANFs are able of making up a very effective conductive network in polymer or other matrices at very low loading content. Furthermore, conductive parts fabricated with GANFs added thermoplastic compounds present smoother surface finish than parts fabricated with alternative conductive additives such as carbon black or carbon fibres.

Other properties that set GANFs as an extraordinary product to be used in several industrial applications are:

- Low coefficient of thermal expansion
- Recyclable composite parts
- Anticorrosive properties
- Tribological properties
- High specific surface area
- Mechanical properties improvement

Standard continuous carbon fibres are obtained through different thermal treatments of precursor fibre material. The precursor material is typically a polymer yarn such as rayon or polyacrylonitrile (PAN) or can also be melted and spun pitch.

Grupo Antolin Carbon Nanofibres (GANF): are continuously produced in a single step from the thermal decomposition of hydrocarbons in presence of metallic catalyst particles by the floating catalyst technique at about 1100°C.
## GRUPO ANTOLIN CARBON NANOFIBRES PROPERTIES:

<table>
<thead>
<tr>
<th>MEASURED PROPERTY</th>
<th>UNIT</th>
<th>GANF</th>
<th>GANF graphitized</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIBRE DIAMETER (TEM)</td>
<td>nm</td>
<td>20 - 80</td>
<td>20-80</td>
</tr>
<tr>
<td>FIBRE LENGTH (SEM)</td>
<td>µm</td>
<td>&gt;30</td>
<td>&gt;30</td>
</tr>
<tr>
<td>BULK DENSITY</td>
<td>g/cc</td>
<td>&gt;1.97</td>
<td>≈2.1</td>
</tr>
<tr>
<td>APPARENT DENSITY</td>
<td>g/cc</td>
<td>0.060</td>
<td>0.085</td>
</tr>
<tr>
<td>SURFACE ENERGY</td>
<td>mJ/m²</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>SPECIFIC SURFACE AREA BET (N₂)</td>
<td>m²/g</td>
<td>150-200</td>
<td>105-115</td>
</tr>
<tr>
<td>GRAPHITIZATION DEGREE</td>
<td>%</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>ELECTRICAL RESISTIVITY</td>
<td>Ohm·m</td>
<td>10⁻³</td>
<td>10⁻⁴</td>
</tr>
<tr>
<td>METALLIC PARTICLES CONTENT</td>
<td>%</td>
<td>6-8</td>
<td>0.1 - 0.2</td>
</tr>
</tbody>
</table>

## DIAMETER DISTRIBUTION GANF NANOFIBRES TEM (Transmisión Electron Microscopy)

![Diameter Distribution Graph](image-url)
COMMERCIALIZED FORMS

Powder: pristine or graphitized GANF carbon nanofibres in 250 g PE bags.

Suspensions in solvents: Stable suspensions of GANF in alcohol, ketone, water, etc.

Thermoset Polymers: Carbon nanofibres incorporated in thermoset resins (unsaturated polyester, vinyl ester, epoxy, etc.). Different concentrations for diluting or direct use.

Materbatch thermoplastic compounds: Carbon nanofibres incorporated in PP, PE, PC, PA6, PA66, PA11, PA12 and other thermoplastic matrices. Developed jointly with Grupo Repol.

GANF incorporated in ceramics for conductive or tribological applications. Developed jointly with Bioker.

GANF incorporated in prepgres of thermoset resins with glass or carbon fibres. Developed jointly with Sispra.
Applications of Grupo Antolin Carbon Nanofibres (GANF)

**Aerospace and Aeronautics**
- Conductive Adhesives
- Microelectronics
- Sensors
- Enhanced Thermal Management
- EMI Shielding
- Rocket ablative nanocomposite
- Conductive Coatings and Paints
- Lightweight antennas

**Automotive**
- Fuel system: Fuel tanks, fuel lines, fuel pipes and connectors, fuel pumps...
- Electrostatically paintable plastic components: Mirror housing, door handles, airbag covers, fenders, bumpers...
- Braking systems
- Engine parts

**Energy**
- Bipolar plates FC
- Electrode catalyst support PEMFC
- Supercapacitors
- Lithium-ion batteries

**Electronics**
- Materials for ESD
- Transport and storage containers for electronics
- Plastic components internal to a computer hard disc drives
- Cleanroom equipment
- EMI Shielding
- Microelectronics

**Textile**
- Smart textiles

**Chemistry**
- Catalyst support

**CARBON NANOFLBRES GANF**

http://www.grupoantolin.com