Pitch based Carbon Fiber
is Coal Tar based Carbon Fiber.
has very unique properties vs. PAN based CF

Advantages of Pitch based Carbon Fiber
- Light weight and High modulus
- Low vibration
- Dimensional stability: low thermal expansion
- High thermal conductivity
- Electrical conductivity

<table>
<thead>
<tr>
<th></th>
<th>Pitch Based CF</th>
<th>PAN Based CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Modulus</td>
<td>55 - 900 GPa</td>
<td>160 - 600 GPa</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>up to 4000 MPa</td>
<td>up to 6400 MPa</td>
</tr>
<tr>
<td>Density</td>
<td>2.0 – 2.2 g/cm³</td>
<td>1.7 – 1.9 g/cm³</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>up to 900 W/mK</td>
<td>up to 200 W/mK</td>
</tr>
<tr>
<td>Applications</td>
<td>Sporting Goods Industry Satellite</td>
<td>Aerospace Sporting Goods Industry</td>
</tr>
</tbody>
</table>
**Company Name**: Nippon Graphite Fiber Co.

**Established**: April, 1995

**Head office**: Himeji, Hyogo, Japan

**Factory**: Himeji, Hyogo, Japan

**Share holder**: Nippon Steel Sumikin Materials Co.

JX Nippon Oil & Energy Co.

**Products**: Pitch Based Carbon Fiber

**Capacity**: 200 MT/Y

**History**:

- **1995**: Established as joint venture between Nippon Steel and Nippon Oil
- **2001**: ISO9001 acquired
- **2010**: New production line started (200 MT/Y)

**Products**

- **YARN**
- **Prepreg**
- **Fabric**
- **Chopped Milled**
Tensile Strength (MPa) vs. Tensile Modulus (GPa)

- **NGF**
- **PAN CF**

**Materials and Applications:**

- **Steel**
- **Aluminum**
- **YSH,YS; Satellite (Antenna, Solar panel, Structure)**
- **High performance sporting goods** (Bicycle, Golf shaft, Fishing Rod)
- **XN; Industry, Civil engineering, Construction, Sporting goods**

**Legend:**

- **XN**
  - XN-05
  - XN-10
  - XN-15
  - XN-60
  - XN-80
  - XN-90

**Graph Notes:**

- **Golf shaft**
- **Fishing rod**
**Light weight and high stiffness**

![Bar chart showing specific modulus for different materials](image)

- Pitch CF XN80 (780GPa)
- Pitch CF XN60 (620GPa)
- PAN CF (230GPa)
- Aluminum
- Steel
- Ceramics (Al2O3)

**Low vibration**

![Graph showing vibration damping pattern](image)

**Pitch CF laminate XN80**

**PAN CF 230GPa**
High Thermal Conductivity

<table>
<thead>
<tr>
<th>Material</th>
<th>Thermal Conductivity (W/m k)</th>
<th>Density (g / cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XN-100</td>
<td>900</td>
<td>2.22</td>
</tr>
<tr>
<td>HC-600</td>
<td>600</td>
<td>2.22</td>
</tr>
<tr>
<td>XN-90</td>
<td>500</td>
<td>2.19</td>
</tr>
<tr>
<td>XN-80</td>
<td>320</td>
<td>2.16</td>
</tr>
<tr>
<td>Copper</td>
<td>400</td>
<td>8.9</td>
</tr>
<tr>
<td>Aluminum</td>
<td>100-200</td>
<td>2.7</td>
</tr>
<tr>
<td>Boron Nitride (BN)</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td>PAN CF(HM)</td>
<td>70</td>
<td>1.8</td>
</tr>
<tr>
<td>PAN CF (230GPa)</td>
<td>10</td>
<td>1.8</td>
</tr>
</tbody>
</table>
Roller

Automotive automation; transfer press line

Robot arm

C/C composite

Civil engineering

Satellite parts

Thermal conductive parts