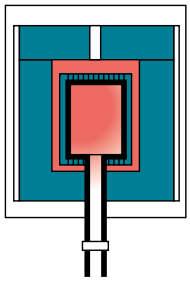
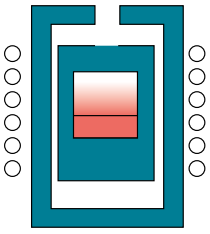
sgl carbon

# SIGRAFLEX®

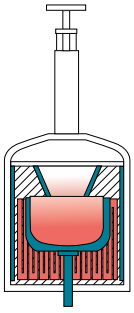
## Flexible graphite foils and sheets for semiconductor and LED industry



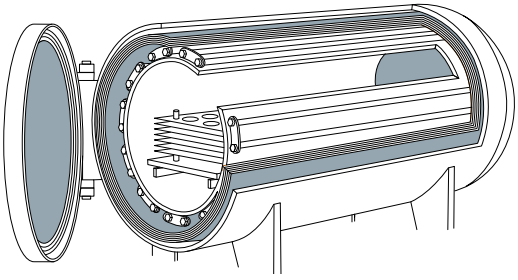
↑ Sapphire single crystal growth



↑ SiC sublimation growth



↑ Si mono-crystal growth (CZ)



**SIGRAFLEX products manufactured from expanded natural graphite improve the performance of systems and processes in high temperature applications, minimize energy consumption and stand for reliability.**

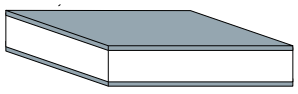
All processes used to grow semiconductor crystals operate at high temperatures in aggressive environments – whether CZ for silicon, HEM for sapphire or PVT for SiC bulk growth. This is why the hot zones of industrial crystal growth furnaces are generally equipped with heat- and corrosion-resistant graphite components.

SIGRAFLEX flexible graphite foils are free of adhesives and binders. Demonstrating its extraordinary properties, it can be used in ultra-high temperature applications ranging up to 3000 °C in inert atmosphere or vacuum. Superior thermal and electrical conductivity makes it a suitable material for a wide range of parts and components in poly crystalline silicon and semiconductor, solar and other ceramic production equipment.

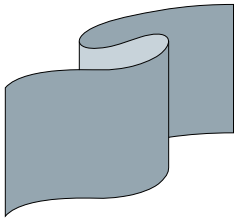
It can be provided in high purity (SIGRAFLEX TH or HP) and ultra-high purity (SIGRAFLEX THP or UHP) to prevent product contamination. SIGRAFLEX is often used in combination with SIGRATHERM® soft and rigid felts, SIGRABOND® carbon fiber reinforced carbon and SIGRAFINE® synthetic graphite.

**Properties**

- Soft and flexible, inert, highly impermeable
- Light weight, simple machining, cutting and punching
- Thermal dissipation, electrically conductive, no static charges
- Excellent chemical resistance
- High purity
- Sheets are available with pinholes for outgassing
- No embrittlement, no aging
- No wetting by glass, ceramic or metal melts
- Very good resistance to thermal shock



← Protective liners and diffusion barriers – Off-gas from production parts can build up undesired deposits and dendrites or could corrode or oxidize graphite furnace parts. SIGRAFLEX is used as a protective liner on carbon and graphite components like rigid felt resulting in a longer service life.



← Release liners – A low friction coefficient, being bendable and thermally conductive makes SIGRAFLEX a perfect material for this application. These properties allow high efficiencies and short turnaround times.

## Material data of SIGRAFLEX® flexible graphite foils and sheets

| Typical properties | Units | TH | THP | HP | UHP |
|---|---|---|---|---|---|
| Standard density | g/cm³ | 0.7/1.0/1.2/1.3 | 1.0 | 1.12 | 1.12 |
| Ash content (ASTM C561 or DIN 51903) | % | ≤ 0.15 | ≤ 5 or 10 ppm* | ≤ 0.20 | ≤ 200 ppm |
| Carbon content | % | ≥ 99.85 | ≥ 99.999 or 99.9995* | ≥ 99.8 | ≥ 99.98 |
| Material thickness (supplied as sheets) | mm | 1.0/1.5/2.0/3.0 | | 0.76/1.52/3.05 | 0.76/1.52/3.05 |
| Material thickness (supplied on rolls) | mm | 0.15/0.2/0.25/ 0.35 0.50/0.80/1.0 | 0.25/0.35 0.5/0.75 | 0.25/0.51 0.76/1.52 | 0.25/0.51 0.76/1.52 |
| Roll width | mm | 500/1000 | 500/1000 | 508/762/1524 | up to 50 |
| Standard roll length | m | 50 | 50 | 96 | 30 |
| Sheet sizes | mm | 500 x 1000 1000 x 1000 up to 1500 x 2500 | 500 x 1000 1000 x 1000 | up to 1524 x 1524 | up to 1524 x 1524 |
| Availability | | EU grade | EU grade | US grade | US grade |

* Ash content ≤ 10 ppm and carbon content ≥ 99.999 % is standard, ≤ 5 ppm and ≥ 99.9995 % on request

## Material data of SIGRAFLEX® TH with a density of 1.0 g/cm³

| Typical properties | | Units | Values |
|---|---|---|---|
| Sublimation temperature | | °C | > 3000 |
| Temperature resistance | in air<br>in inert gas and vacuum | °C | approx. 400<br>approx. 3000 |
| Specific electrical resistivity (20 °C) | perpendicular to surface<br>parallel to surface | µΩm | 700<br>11 |
| Thermal conductivity (20 °C) | perpendicular to surface<br>parallel to surface | $Wm^{-1}K^{-1}$ | 5<br>220 |
| Specific heat capacity (20 °C) | | $kJkg^{-1}K^{-1}$ | 0.7 |
| Thermal expansion coefficient (20 – 1000 °C) | perpendicular to surface<br>parallel to surface | $10^{-6}K^{-1}$ | approx. 50<br>approx. 1 |
| Permeability coefficient for air | perpendicular to surface | $cm^2/s$ | $2 \times 10^{-5}$ |
| Coefficient of emission (1500 °C) | | | 0.65 |

## Typical element contents of SIGRAFLEX® TH and THP

| Typical impurities | Units | TH | THP |
|---|---|---|---|
| Alkali metals | ppm | 60 | < 1 |
| Alkaline earth metals | ppm | 50 | < 1 |
| Halogens | ppm | 10 | < 1 |
| Sulfur | ppm | 5 | < 1 |
| Silicon | ppm | 60 | 1 |
| Ash content (DIN 51903) | ppm | ≤ 1500 | ≤ 10 |

Unless stated otherwise, all values are valid at room temperature, typical, non-binding and subject to change. For engineering or design purposes please contact our technical sales team.

**Graphite Solutions | SGL CARBON GmbH | SGL Technic LLC**
Sales Europe/Middle East/Africa | sigraflex-europe@sglcarbon.com
Sales Americas | sigraflex-americas@sglcarbon.com
Sales Asia/Pacific | sigraflex-asia@sglcarbon.com
www.sigraflex.com | www.sglcarbon.com

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