



MATERIALS SUBSTRATES

- HOPG & Mica Substrates J 51

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HIGHLY ORDERED PYROLYTIC GRAPHITE HOPG

HOPG, is a relatively new form of high purity carbon and provides microscopists with a renewable and smooth surface. Unlike mica, HOPG is completely non-polar, and for samples where elemental analysis will also be done, it provides a background with only carbon in the elemental signature. The extreme smoothness of HOPG gives results in a featureless background, except at atomic levels of resolution.

The structure is strictly columnar, which means, the columns run vertically within the flat slab of the material. The grain boundaries can be seen on the lateral surfaces. The mosaic spread is the angle of deviation of the grain's boundary from this perpendicular axis (of the columnar structure).

USE AT ELEVATED TEMPERATURES

As more and more applications are found for HOPG in research and technology, more and more applications are requiring good high temperature characteristics. We can report the following information which should be useful for those contemplating such usage:

- Air: 500°C (Starts to burn)
- Vacuum at 0.1 Torr: 2500°C
- Inert atmosphere (N₂, Ar, He): 3500°C

DENSITY OF HOPG

The density for all three grades (ZYA, ZYB and ZYH) is 2.27 g.cm⁻³.

GRADE ZYA (SPI-1)

Comparable to the very best "calibration grade" HOPG and exhibiting a 0.4° +/- 0.1°. This is the most highly ordered, lateral grain size is typically up to about 3 mm but can be as large as 10 mm, and is used primarily for instrument calibration purposes or for research experiments where for some reason, the very ultimate in HOPG order is needed.

GRADE ZYB (SPI-2)

This grade exhibits a mosaic angle as small as 0.8° +/- 0.2°. This grade is slightly less highly ordered than SPI-1 but is acceptable for most users. The lateral grain size can be up to 0.5 mm but can be as large as 1 mm.

GRADE ZYH (SPI-3)

Exhibits a mosaic angle as small as $3.5^\circ \pm 1.5^\circ$. This grade is much less highly ordered and has a grain size not larger than the range of 30-40 nm.

SQUARES & RECTANGLES

| DIMENSIONS (mm) | P/N SPI-1 GRADE | P/N SPI-2 GRADE | P/N SPI-3 GRADE |
|-----------------|-----------------|-----------------|-----------------|
| 5 x 5 x 1 | 476HP-AB | 479HP-AB | 490HP-AB |
| 7 x 7 x 1 | 498HP-AB | 480HP-AB | 491HP-AB |
| 10 x 10 x 1 | 439HP-AB | 436HP-AB | 429HP-AB |
| 10 x 10 x 2 | 438HP-AB | 446HP-AB | 440HP-AB |
| 12 x 12 x 1 | 426HP-AB | - | - |
| 10 x 10 x 0.2 | 424HP-AB | - | - |
| 10 x 10 x 3 | - | 456HP-AB | 443HP-AB |
| 20 x 20 x 1 | - | 466HP-AB | 449HP-AB |
| 20 x 20 x 2 | - | 444HP-AB | 448HP-AB |
| 20 x 20 x 3 | - | 447HP-AB | 451HP-AB |

DISCS

3 mm diameter to fit into a standard TEM grid holder, 50-75 μm thick, shipped in a BEEM Dial-A-Grid box.

| Packaging | P/N |
|-------------------|----------|
| Pack of 20 discs | 423HP-CA |
| Pack of 100 discs | 423HP-MB |

MICA SHEETS, STRIPS AND DISCS

The only mica offered by Neyco is of the muscovite type and indeed, we only offer the highest qualities of the mineral.

APPLICATIONS

For AFM studies, and for those making either carbon films or doing thin film coating research and wanting a higher quality mica as defined as having fewer "steps" on a freshly cleaved surface, we would recommend grade V-4. This grade is also great for use with AFM where a polar substrate is desired or

where polarity of the substrate does not matter.

For AFM calibration studies or perhaps the ultimate substrate for carbon film production, we offer the grade V-1. Mica can also be used as a substrate for binding cells to be characterized by TEM.

- Chemical Formula: $\text{K}_2\text{OAl}_2\text{O}_3\text{SiO}_2$
- Appearance: Semi clear to gray translucent sheets, strips, and discs
- Specific Gravity: 2.7 g.cm^{-3}
- Hardness on Mohs scale of hardness: 2 - 2.25

- Grade V-1 Muscovite: Highest possible quality
- Grade V-4 Muscovite: Premium research quality
- Grade V-5 Muscovite: Research quality

SQUARES & RECTANGLES

| THICKNESS | LATERAL SIZE (mm) | PACKAGING | GRADE V-1 | GRADE V-4 | GRADE V-5 |
|-----------|-------------------|------------|-----------|-----------|-----------|
| 0.15 mm | 50 x 25 | Pkg of 1 | 01792-AB | - | - |
| | 50 x 25 | Pkg of 20 | 01792-CA | 01876-CA | - |
| | 50 x 25 | Pkg of 100 | 01792-MB | 01876-MB | - |
| | 25 x 25 | Pkg of 1 | 01872-AB | - | - |
| | 25 x 25 | Pkg of 20 | 01872-CA | - | - |
| | 25 x 25 | Pkg of 100 | 01872-MB | - | - |
| | 15 x 15 | Pkg of 20 | 01868-CA | 01869-CA | - |
| | 15 x 15 | Pkg of 100 | 01868-MB | 01869-MB | - |
| | 75 x 50 | Pkg of 20 | - | - | 01804-CA |
| | 75 x 25 | Pkg of 20 | - | - | 01805-CA |
| | 75 x 25 | Pkg of 100 | - | - | 01805-MB |
| | 40 x 10 | Pkg of 100 | - | - | 01806-MB |
| 0.26 mm | 25 x 25 | Pkg of 20 | - | 01870-CA | - |
| | 25 x 25 | Pkg of 100 | - | 01870-MB | - |
| | 50 x 25 | Pkg of 20 | - | 01791-CA | - |
| | 50 x 25 | Pkg of 100 | - | 01791-MB | - |
| | 75 x 25 | Pkg of 20 | - | 01875-CA | - |
| | 75 x 25 | Pkg of 100 | - | 01875-MB | - |
| | 80 x 40 | Pkg of 25 | - | 01918-CF | - |
| | 40 x 10 | Pkg of 10 | - | - | 01806A-BA |
| | 40 x 10 | Pkg of 100 | - | - | 01806A-MB |

DISCS

| THICKNESS | DIAMETER (mm) | PACKAGING | GRADE V-1 | GRADE V-4 | GRADE V-5 |
|-------------------|---------------|------------|-----------|-----------|-----------|
| 0.05 mm | 3.05 | Pkg of 100 | 01900-MB | - | - |
| | 3.05 | Pkg of 20 | 01900-CA | - | - |
| 0.15 mm | 9.5 | Pkg of 100 | 01873-MB | 01874-MB | - |
| | 9.5 | Pkg of 20 | 01873-CA | 01874-CA | - |
| | 12 | Pkg of 100 | 01877-MB | 01879-MB | - |
| | 15 | Pkg of 100 | 01878-MB | 01880-MB | - |
| | 22 | Pkg of 100 | 01920-MB | 01921-MB | - |
| 0.26 mm | 9.9 | Pkg of 20 | - | - | 01871-CA |
| | 9.9 | Pkg of 100 | - | - | 01871-MB |
| 0.275 to 0.325 mm | 12 | Pkg of 100 | 01925-MB | - | - |
| | 25 | Pkg of 100 | 01926-MB | - | - |
| 0.05 mm | 3.05 | Pkg of 100 | - | 01923-MB | - |
| | 3.05 | Pkg of 20 | - | 01923-CA | - |



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