FREUDIGER

KYROPOULOS SAPPHIRE

The Kyropoulos method is a technique primarily used to grow large, high-quality single crystals of Sapphire.

Growth Process

- The crystal grows in a large crucible so large boules are possible
- Slow cooling to minimize stress and defects.
- Material growth starts from a seed crystal precisely placed in the crucible to define material orientation

Chemical Composition

- Minimum 99.99% Al_2O_3 (Aluminum oxide)
- Kyropoulos Sapphire is chemically identical to natural Sapphire, consisting of pure aluminum oxide with minimal impurities.

Physical Properties

- Hardness: 9 on the Mohs scale, making it extremely hard and durable.
- Density: Approximately 3.98 g/cm^3.
- Transparency: High transparency, often with fewer internal flaws or inclusions than Sapphires grown with Verneuil method

Optical Properties

- Clarity: High clarity with fewer inclusions
- Refractive Index: 1.762 - 1.770
- Birefringence: 0.008 - 0.011

Mechanical Properties

- Strength: High mechanical strength, making it suitable for high loads
- Wear Resistance: Exceptional wear resistance due to its hardness.

Thermal Properties

- Melting Point: Around 2,050°C, like all corundum-based materials.
- Thermal Conductivity: High thermal conductivity, making it suitable for heat-dissipating components in electronics.
- Thermal Shock Resistance: Excellent. Good for applications with rapid temperature changes.

Applications

- Optics and Electronics: Kyropoulos Sapphires are widely used in high-tech industries, including for LED substrates, optical windows, watch faces, and in scientific instruments.
- Aerospace: Used in windows for spacecraft due to its high clarity, strength, and thermal resistance.
- Jewelry: Although it is primarily used for industrial purposes, high-quality Kyropoulos Sapphire can be cut into gemstones for jewelry.
- Due to the method of growth, Kyropoulos Sapphires are often used in high-precision optical applications

Market Value

- Lower internal stress and fewer defects means easier cutting, polishing and shaping into wafers, domes and lenses
- Ideal for infrared (IR) windows