

ADVANTAGES OF HPDA®

Comparison of HPDA® to other Raw Materials

| | HPDA® | Crackle (Verneuil) | Pressed Powder | Powder | Cold crucible |
|---|-------|------------------------|-------------------|--------|------------------|
| Specifically designed for LED Sapphire Industry. | Yes | No | Yes | No | Yes |
| 99,999% Purity. | Yes | No | No | Yes | No |
| High levels of uncontrolled impurities such as Ti, Na, Cr. | No | Yes | Yes | No | Yes |
| Contains hydrogen (water). *leads to reduction of mechanical, optical properties of Sapphire. | No | Yes | Yes | Yes | Yes |
| Access of Oxygen content in raw material. *Leads to bubble formation in Sapphire. | No | No | Yes | Yes | Yes |
| Starting Raw Material purified during the manufacturing process. | Yes | Yes | No | No | No |
| Density of at least 90% of the theoretical density of sapphire. | Yes | Yes | Yes | No | Yes |
| Reduced dwelling time (time required to homogenize melt to allow to start growth process). | Yes | Yes | No | No | No |
| Complete melt charge can be used. | Yes | No | No | Yes | No |
| Increase the lifetime of crucible, hot zone and other parts of the furnace. | Yes | Yes | No | No | No |
| Increased growth rate (Reduced growth time). | Yes | No | No | No | No |
| Increase in yield is about 25%. | Yes | No | No | No | No |
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