



TOP HAT CATHODES



PRODUCT INFORMATION:

For high total emission applications a top hat cathode may be your solution. The large emitting surface coupled with the low work function of a LaB₆ or CeB₆ material facilitates emission currents in the 5mA to 5A range. Carbides (HfC) can also be used where the operating

environment and conditions warrant.

Top hats are available in (100) and (310) crystal orientations and can provide very long lifetimes due to the thickness of the crystal and isotropic evaporation across the emitting surface. When operated at 1800 K in vacuums equal to or better than 5×10^{-7} torr, top hats can continue emitting high currents for thousands of hours. The lower work function of (310) CeBix™ makes a top hat of this configuration a powerhouse of emission.



OUR SPECIALTIES:

CEBIX™ CATHODES

APTech Exclusive Product;
Direct Replacement for LaB₆

R&D PARTNERING

End-Users, OEMs, Government

LAB₆ CATHODES

Full Line Offered

FIELD EMITTERS

Electrochemically Etched, Several
Materials

REBUILDING SERVICES

Restoring LaB₆, CeB₆, Carbide, and
Tungsten Emitters

REFRACTORY METALS

Tungsten, Molybdenum, & Many More

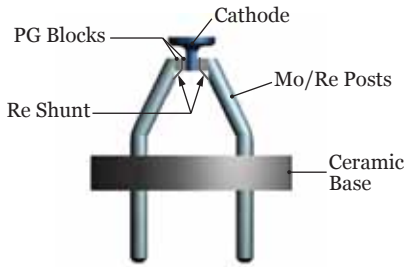
CREATING YOUR NEXT GENERATION PRODUCTS

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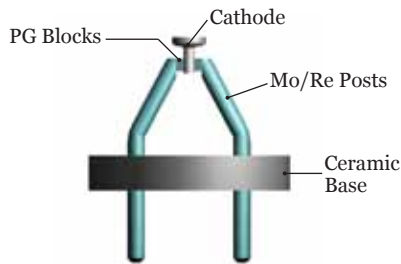


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ADDITIONAL TOP HAT INFORMATION



Shunted (SMVM)



Non-Shunted (MVM)

NEW TOP HAT DESIGN:

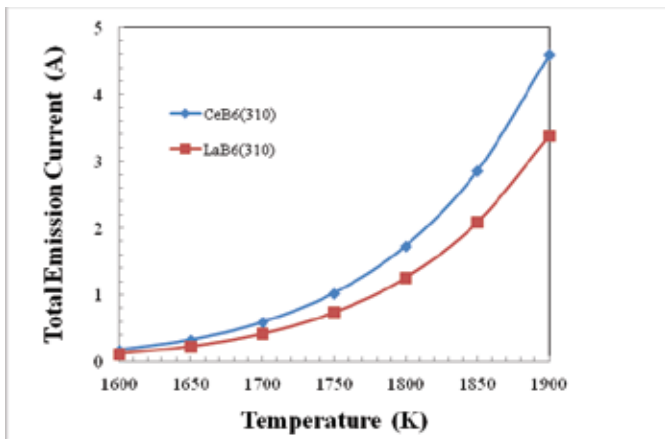
Recently AP Tech redesigned their top hat configuration. Changes were made to both the top hat crystal dimensions and the method in which the crystals are mounted.

The shunted top hat configuration provides added stability and longer lifetimes for our top hat cathodes. Please reference the graph, that shows current voltage and power data over various temperatures for a 2.8 mm LaB₆ (100) shunted cathode.

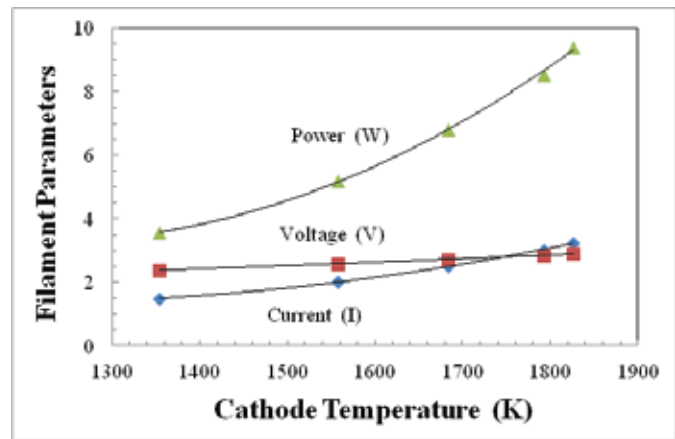
AP Tech provides a shunted top hat of many different materials varying in sizes from 1 mm to 2.8 mm. These cathodes can be mounted on a variety of bases to fit your system configuration. Contact us for different mounting options.

The use of rhenium shunt in conjunction with the MVM was inherited from FEL. Since many SEM's and their electronics were designed around a tungsten hairpin filament, the resistance change with temperature of the PG used in the MVM is sometimes problematic. The resistance of the shunt enables the cathode to better match the temperature and resistance curve of a tungsten filament. In the shunted version, the current bypasses the outer PG block by taking the path of least resistance through the shunt. All of the heating is generated by the inner block. The design takes advantage of the anisotropic properties of PG by orienting the poor thermal conduction plane in the direction between the shunt and the Mo/Re post.

GRAPHS & TABLES



Calculated emission current for 2.8mm diameter Top Hat ($A = 120 \text{ A/cm}^2 \cdot \text{K}^2$)



Graph shows data of 2.8mm LaB₆ shunted Top Hat cathode.

Material	(100) Work Function	(310) Work Function	Evaporation Rate at 1800 K	Current Density (310) Face at 1800 K	Maximum Current from 2.8mm Diameter Top Hat at 1800 K
LaB ₆	2.66 eV	2.60 eV	16.8 nm/hr	20 A/cm ²	1.3A
CeB ₆	2.60 eV	2.55 eV	12.0 nm/hr	28 A/cm ²	1.7A
HfC	3.6 eV	3.4 eV	0.15 nm/hr	0.12 A/cm ²	0.01A