

For over 45 years, Semicon Associates' core business has been tungsten dispenser cathodes. Semicon has extensive experience in supplying cathodes and cathode assemblies for virtually any application or customer requirement, producing over 20,000 cathodes each year. These cathodes consist of a porous tungsten matrix impregnated with a barium based emission enhancing material.

Additional structures such as support sleeves, mounting flanges, heat shields, potted heaters, and emission shields are commonly added per customer requirements. (See Value Added Assemblies insert.) The cathode matrix may also be a mixed metal such as tungsten iridium or tungsten molybdenum (Sembo).

Dispenser cathodes are used in all types of vacuum devices and in inert and reducing atmospheres. The most common applications include TWTs, klystrons, magnetrons, and plasma devices.

Semicon controls the entire cathode manufacturing process, beginning with basic raw materials and including the manufacturing of critical components. Our standard manufacturing process includes chemical cleaning of the emitting surface which ensures open porosity, which is verified using scanning electron microscopy. All cathode heater assemblies, if applicable, are 100% tested for proper heater operation. Semicon has quality systems in place that can provide fully flight qualified cathode assemblies with all required backward and forward material and process traceability.

Semicon's engineering staff is ready to assist in any custom design requirement. We can assist in arriving at a design that will satisfy the customer's requirements while maintaining manufacturability. We can also assist in establishing the tradeoffs needed to obtain required emission, limit barium evaporation rate, and provide adequate lifetime.



Dispenser Cathodes

Typical Specifications

Commercial, Military, or Space Qualification

Size Range	Ø.010" – 8.00" (0.25 mm – 200 mm)
Tungsten Density Range	74% – 84%
Impregnant Types	4:1:1 (S), 5:3:2 (B), 6:1:2, 3:1:1, or any other required type
Sputter Coatings	Osmium Ruthenium (M), Iridium. Other coatings possible.
Materials	Tungsten, molybdenum, molybdenum-ruthenium, rhenium, tungsten-rhenium, Kovar, nickel, stainless steel, Monel, and others.
Machined Tolerances	To ±.0002" (±0.005 mm)
Brazes	Ranging from molybdenum-ruthenium (mp 1980°C) to low temperature alloys such as copper-gold (mp 910°C)
Operating Temperature	From 910°C _B to 1200°C _B
Emission Density	Continuous, as high as 20 A/cm ² , typically 2-5 A/cm ² ; pulsed, as high as 120 A/cm ² , typically 30-70 A/cm ²
Life Expectancy	From 3,000 hours to 150,000 hours

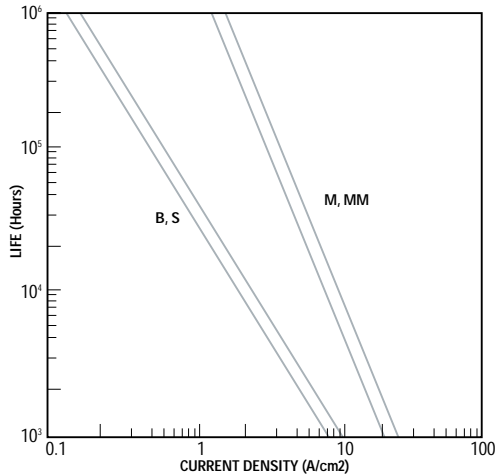


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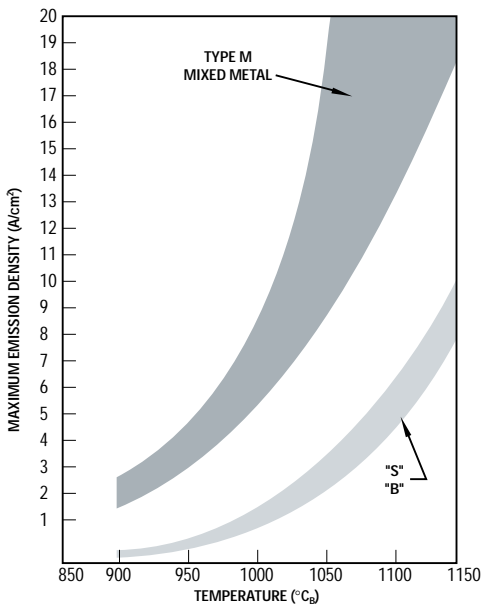
Beyond technical expertise, we offer a market and team driven approach. Semicon Associates will partner with you to develop customized solutions tailored to your needs. Our partnership continues after the sale is completed to ensure you get maximum benefit from your purchase.



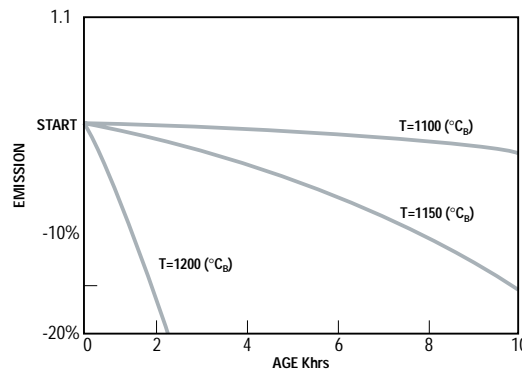
Application of Emissive Material



Current Density vs. Life for Impregnated Dispenser Cathodes



Performance Comparison



M Cathode Life Expectancy vs. Temperature

Longo, R.T. et. al. "Dispenser Cathode Life Prediction Model" IEDM1984, p. 318

Cathode Type	Description	Work Function
B	Porous tungsten impregnated with 5:3:2 BaO-CaO-Al ₂ O ₂	2.1 ev
S	As above (4:1:1)	2.1 ev
M	Above coated with Os/Ru	1.8 ev
MM	Porous tungsten iridium with BaO-CaO-Al ₂ O ₂	1.8 ev

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