

Controlled Expansion Materials for Thermal Management in Photonics

Target Applications: Optical Platforms and Optoelectronic Packaging

Spectra-Mat has developed a high temperature sinter and infiltrate process for the manufacture of controlled expansion composite (CEC) materials. Our sinter and infiltrate process allows SMI to offer thick (up to 1.5 cm - hermetic) and thin (down to .010 cm) tungsten/copper components with the ability to achieve extremely flat surface conditions. We use only high purity raw materials. There are no lubricants or sintering aides added during processing. The result is a CEC component with excellent dimensional stability (CTE), thermal uniformity (TC), and flatness applicable to optoelectronic applications.

Tungsten Based Material – Typical Properties

Material Composition (Wt %)	75/25 W/Cu	80/20 W/Cu	85/15 W/Cu	90/10 W/Cu	95/3.5/1.5 W/Ni/Cu
CTE (x10 ⁻⁶ /K) 25°C - 400°C	8.1	7.6	7.0	6.4	5.2
TC (W/m·K) 25°C	228	219	210	201	75
Density (gm/cm ³)	15.7	16.2	16.6	17.2	18.2

Spectra-Mat's Unique Process Offers the Following Advantages:

- Ability to vary metal matrix density to achieve optimum combination of CTE and TC values
- Excellent dimensional stability unaffected by high temperature cycling
- Machinable to exceptional flatness and surface finish
- Superior thermal conductivity compared to competitive products
- Metallization capability includes electrolytic and electroless plating and thin film deposition

These characteristics make Spectra-Mat's tungsten composites ideally suited for high power laser diode applications, silicon and III-V semiconductor materials, DWDM optical platforms and optoelectronic packages.

Manufacturing Capabilities[†]

Polished Surface Finish

Mirror	< 0.03 micron Ra
Matte	0.4 - 0.5 micron Ra

Dimensional [Typ. Laser Diodes]

Surface Flatness	2.5 micron / cm
Thickness	0.010 - 1.4 cm (0.020 cm typ.)
Max Dimension	25 cm
Edge Radius	< 5 micron

Metallization

Electroplated	Ni, Ni/Au, Ni/Cu, others
Physical Vapor Deposition	All of the above, Ni/Pt/AuSn

[†]Best case for amenable designs

SMI also offers molybdenum/copper composites for weight sensitive applications.

For additional information, applications, or pricing, please contact:

(PB-601 — A 1/06) © SMI 2006