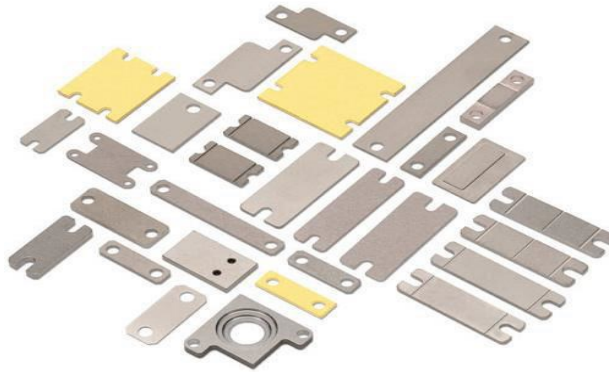


THERMAL MANAGEMENT SOLUTIONS

Material selection and component design and manufacture are key to an effective thermal management packaging solution. With a wide range of material options, we have solutions that provide the optimal thermal management performance for today's microelectronics. Egide has the expertise to solve complex thermal management challenges associated with device power and performance requirements in hermetically sealed packages.



REFRACTORY METAL COMPOSITES (MoCu and WCu)

Egide/Santier produces both Molybdenum/Copper (MoCu) and Tungsten/Copper (WCu) metal matrix composites. These composites can be blended to optimize thermal expansion and conductivity to suit the application material set and heat dissipation requirements.

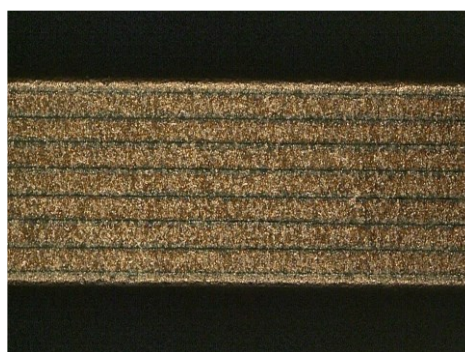
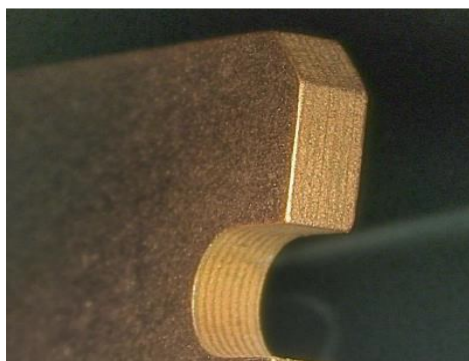
At Egide we utilize a powder metallurgy process to produce a near net shape matrix of substrate. This is done with a propriety Molybdenum (Mo) or Tungsten (W) powder process. The resulting 'sponge' is sintered and infiltrated with Copper (Cu) to uniformly distribute the copper throughout the matrix and produce the final composite. This process is free from any binders or voids and produces a more uniform and repeatable distribution of material and performance than competing processes.

LAMINATES (CMC and S-CMC)

Copper and Molybdenum laminates are available to provide excellent thermal conductivity with matched CTE values. The laminates are produced using copper and molybdenum foils and diffusion bonding the layers together which enables very high copper content (up to 95%) and the associated thermal performance, but with restrained CTE values from 6-10 ppm.

The bonded sheets can be machined and plated to suit your application needs. Standard compositions are typically stocked while unique application needs can be met with a custom layer stack-up.

Material	Material Code	Density @ 20°C [g/cm ³]	Thermal Conductivity [W/mK]		Thermal Expansion @ 20°C [x 10 ⁻⁶ /°C]	Young's Modulus @ 20°C [Gpa]	Vickers Hardness [HV 10]
			XY-direction	Z-direction			
CuW	W90/Cu10	17,1	174	174	6,4	330	300
	W87/Cu13	16,8	183	183	6,7	320	290
	W85/Cu15	16,4	188	188	7,3	310	280
	W80/Cu20	15,5	206	206	8,3	280	260
	W78/Cu22	15,2	210	210	8,5	275	256
CuMo	Mo85/Cu15	9,8	160	160	6,8	245	175
	Mo70/Cu30	9,7	195	195	7,5	225	170
	Mo60/Cu40	9,6	208	208	8,7	196	160
	Mo50/Cu50	9,5	240	240	9,9	172	150
Laminate CuMo	CMC (Mo74/Cu26)	9,8	200	170	5,7		
	S-CMC (Mo5/Cu95)	9	381	362	14,8		
	S-CMC (Mo20/Cu80)	9,2	344	291	7,4		
	S-CMC (Mo40/Cu60)	9,5	290	230	6,6		



Above images represent cross sections of multi layer SCMC showing the alternative copper and moly stackup. Parts can be cut to simple or complex geometries and plated to meet package and assembly requirements.

ADDITIONAL MATERIALS

Beyond the above mentioned, we regularly work with materials commonly used in the industry, such as Copper, Aluminum, Titanium, and Kovar. We also research and work with advanced materials, such as metal diamond composites.

Our expertise goes beyond just providing these materials, we have decades of experience machining, plating and assembling these material sets to provide exceptionally reliable products for a wide range of applications.