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DLI DIELECTRIC LABORATORIES

Single-Layer Plating

There are two process used by Dielectric laboratories Inc in applying metallized layers to its ceramic capacitor products; “***Sputter Deposition***” and “***Wet Plating***”.

The deciding factor in determining which process is employed is dependentt upon the material. Due to the material composition/formulation, certain materials are best suited for one process or the other.

Sputter Deposition

A method of coating ceramic, this process takes place in a high vacuum process chamber. In sputtering, atoms are ejected from the surface of a target deposition material from which they condense on another surface, thus creating a metallized surface.

There are several different options available within the “*Sputtering*” process. They are outlined below:

Process	Detail	Comment
S1	Au 100µ” over NiV 50µ” over TiW 300Å	SnPb Solder, Epoxy
S2	AuSn 300µ” over NiV 50µ” over TiW 300Å	Euetictic AuSn, AuSi, AuGe
S5	Au 100µ” over TiW 300Å	Euetictic AuSn, AuSi, AuGe, Epoxy

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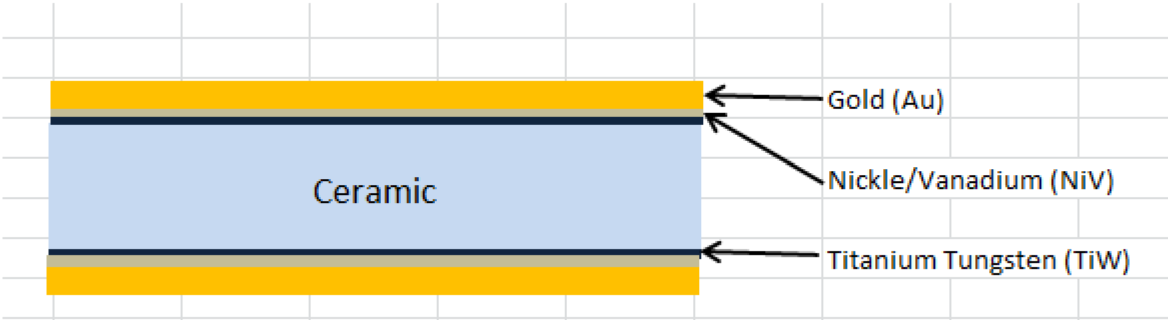
The sputtering process has an adhesion layer Titanium Tungsten (TiW) under the barrier layer Nickle-Vanadium (NiV), whereas Wet Plating utilizes the Nickle (Ni) layer as both the adhesion and barrier layer. Listed below is an example of a S1 deposition



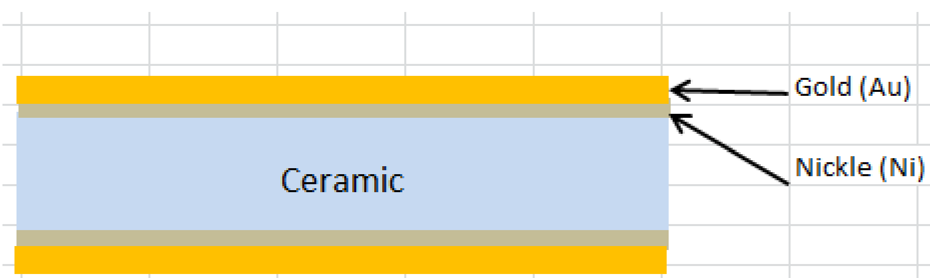
The sputtering process is much more consistent in terms of the metal layer thickness when measured across the plate. Wet Plating will typically show peaks and valleys across the plate.

Wet Plating

This is a method in which the Ni coating is applied without the use of electricity, this process is called "Electroless" plating. The Au coating however uses an "Electrolytic" process.

As opposed to a *"Sputtered"* process, there is only one option available with "*Wet Plating"*:

Process	Detail	Comment
Au-100	Au 100µ" over Ni 75µ"	SnPb Solder, Epoxy



Single-Layer Materials and their associated plating process:

Class	Material Code	Temperature Coefficient -55°C to +125°C	Dissipation Factor @ 1MHz.	Insulation Resistance		Metallization Process
				+25°C	+125°C	
1	CF	0 ±15 ppm/°C	0.6	$>10^6$ MΩ	$>10^5$ MΩ	Sputtered
	CD	-20 ±15 ppm/°C	0.15	$>10^6$ MΩ	$>10^5$ MΩ	Sputtered
	CG	0 ±30 ppm/°C	0.7	$>10^6$ MΩ	$>10^5$ MΩ	Sputtered
	NR	-1500 ± 500 ppm/°C	0.25	$>10^6$ MΩ	$>10^5$ MΩ	Sputtered
	NS	-2400 ± 500 ppm/°C	0.7	$>10^6$ MΩ	$>10^5$ MΩ	Wet Plate
	NU	-3700 ± 1000 ppm/°C	1.5	$>10^6$ MΩ	$>10^5$ MΩ	Wet Plate
	NV	-4700 ± 1000 ppm/°C	1.2	$>10^6$ MΩ	$>10^5$ MΩ	Wet Plate
2	BD	± 15%	2.5	$>10^4$ MΩ	$>10^3$ MΩ	Wet Plate
	BC	± 15%	2.5	$>10^4$ MΩ	$>10^3$ MΩ	Wet Plate
	BE	± 15%	2.5	$>10^4$ MΩ	$>10^3$ MΩ	Wet Plate
	BL	± 15%	2.5	$>10^5$ MΩ	$>10^4$ MΩ	Sputtered
	BJ	± 15%	3.0	$>10^5$ MΩ	$>10^4$ MΩ	Wet Plate
	BN	± 15%	3.0	$>10^5$ MΩ	$>10^4$ MΩ	Wet Plate
3	BU	+22 / -82% (+10°C to +85°C)	3.0	$>10^5$ MΩ	$>10^4$ MΩ	Sputtered
	BV	+22 / -82% (+10°C to +85°C)	3.0	$>10^5$ MΩ	$>10^4$ MΩ	Sputtered

Class 1: Ceramic with high stability and low losses a good design for resonant circuit applications

Class 2: Ceramic with high efficiency for decoupling and by-pass applications

Class 3: Ceramic with very high permittivity (K) but much lower stability

Letter Code Low Temperature	Number Code High temperature	Letter Code Change of Capacitance Over temperature
X = -55°C	4 = +65°C	P = ± 10%
Y = -30°C	5 = +55°C	R = ± 15%
Z = +10°C	6 = +105°C	S = ± 22%
	7 = +125°C	T = +22/-33%
	8 = +150°C	U = +22/-56%
		V = +22/-82%

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