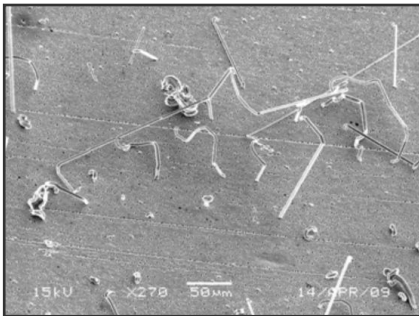


WHISKERS-CAP

Dual Use Coating

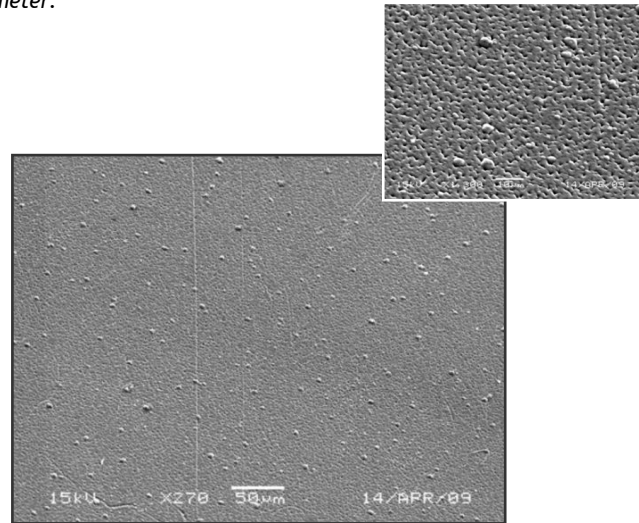
Whiskers-Cap is a dual use coating that provides both tin whiskers containment and hermetic environmental protection. It is optimized to suppress tin whiskers growth, while providing the same high performance environmental protection of ALD-Cap.

Whisker-Cap is the first coating to provide full tin whiskers containment. Accelerated growth testing of more than one year, so far, have shown Whisker-Cap completely suppresses whiskers formation on samples with high propensity to whiskers growth.



Test coupons—50% coated. Uncoated sides show high density of whiskers, some longer than 1 millimeter.

Test coupons—50% coated. Whisker-Cap Coated sides show full whiskers containment. No evolution of nodules or whiskers from small round nodules that existed prior to coating.



The true pin-hole free characteristic of our coatings provides additional protection to your circuits. Whiskers-cap is at least $\times 10^7$ more effective as a corrosion barrier than parylene and other polymer-based conformal coatings (see ALD-Cap Physical Properties table). Mil-Standard hermetic endurance (for example, MIL-STD 883E), together with full tin whiskers containment is achieved with a coating thickness as low as 200 nm.

Ideal Characteristics for Whiskers Containment

The ceramic film stack of Whiskers Cap provides a combination of exceptional adhesion, toughness and hardness that is ideal for whiskers containment. Unlike polymer-based conformal coatings, Whiskers Cap is substantially tougher and harder than tin. At the same time, incorporation of nanolaminates produces pliable films that are optimized to yield > 300% elongation.

Material	Young's Modulus (GPa)	Hardness (GPa)	Elongation to Failure (%)	Stress over Tin	Adhesion to Tin (PSI)
Whiskers-Cap	130	7.8	>300	Tensile	>1,500
Parylene C	3.2 - 2.8	0.13	200	Compressive	<<1,500
Uralane 5750	1.5	<<0.13	250	Compressive	<<1,500
Tin	50	0.14			

Sundew's substrate preparation process and film optimization yield consistent high adhesion to tin, various PCB materials and epoxies, which is comparable to the adhesion strength of galvanized zinc to steel.

Substrate	Application	Coating Adhesion pull strength (PSI)
Immersion Tin	PCB Finish	1,700
Bright Electroplated Tin	PCB Finish	>1,500
Gold	PCB Finish	>1,400
Copper	PCB Finish	>1,600
FR4	PCB Material	>2,500
R/Flex	PCB Material	1,200
Kapton	PCB Material	1,000
Thermosetting Epoxies	PEM package material	>2,500
3M Scotch-Weld 2216 B/A	IC Attachment	>3,300