

ZINC WHISKERS

Can you afford not to use Zinc Nickel? Zinc Nickel has many benefits but here we are going to look a little deeper at one particular area that is changing industry benchmarks.

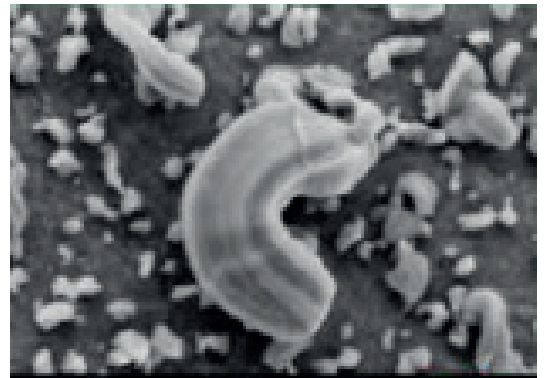
Metal whiskers can be a regular and ultimately very disruptive phenomenon within Tin, Cadmium and Zinc electroplated, both alkaline and acid based products. The whiskers are relatively long, but very thin, single-crystals of Zinc that form sometime after the plating process. The whiskers can take several weeks or even several months to appear, typically reaching sizes of around 2mm by 2microns and wreaking havoc within the electronics industry where they can distort signals and cause short circuits within equipment, ultimately leading to product failure.

Zinc whiskers originate from stress in the coating deposit, generated from either internal or external forces. External stress can originate from such locations as the post manipulation, repeat flexing or thermal expansion of the product. Internal stress comes from within the crystal structure of the coating. In both situations, the stress induces energy release that causes diffusion of the Zinc atoms. This leads to tiny nodules forming on the surface of the coating that grow continuously from the base as more zinc atoms diffuse. The process continues until all the stress is released and no further energy exists to diffuse the atoms. Some coatings have a high misaligned structure and naturally self-alleviate the stress via the expulsion of the misaligned zinc atoms to the surface. Alkaline Zinc is one of these coatings and as such has one of the highest tendencies to form Zinc whiskers.

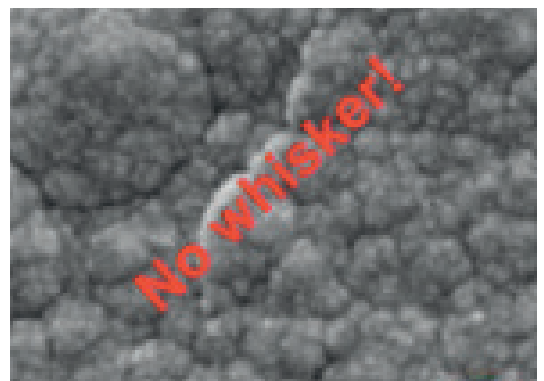
The good news is that there are actions we can take to reduce the risk. Anything that reduces stress in the plating deposit and/or slows down the diffusion of Zinc atoms will slow down the rate of whisker growth. The additional use of passivates and sealers over the electroplated layer can also mitigate diffusion. Reversely, chloride contamination and humidity will accelerate whisker growth. It is hence of the utmost importance to select the best coating process available for the intended application and environment.

Tests on Zinc Nickel deposits, both with and without external stress induction, have shown an absence of zinc whisker formation. The gamma structure of zinc nickel is very different from that of standard zinc and produces inherently much lower and very different internal stress. Its columnar gamma structure generates tensile stress, as opposed to compressive, which is allowed to release without the diffusion of the zinc atoms and hence formation of zinc whiskers on the surface. In addition, its far superior ductility also provides much improved protection from external stress in assembly and/or service.

In conclusion, although research continues, we do know that alkaline zinc nickel coupled with strong passivation and sealer layers currently offer the best protection against the growth of zinc whiskers. Current studies show extensive evidence of no whisker formation from within this process against comparative tests with standard zinc where whisker formation has been extensive. So if you still suffer from the fear of zinc whiskers and are still using standard zinc coatings on your products, isn't it time you made the change to ASTEC 3000.



Alkaline Zinc: significant and extensive zinc whisker formation.



Alkaline Zinc Nickel: no zinc whisker formation.

