

Coating Electropolished Surfaces

Abstract

SilcoTek's coating processes will not remove or hide defects created during the electropolishing process. Many times, SilcoTek's thin (sub-micron or –half-micron) coatings will highlight small surface differences which exist on a metal surface. One difference which will often be highlighted is an effect referred to as electropolish 'frosting' (sometimes 'pitting'). SilcoTek's coating process will even bring out small features which were not visible to the naked eye.

Electropolish 'Frost'

Electropolish 'frosting' is an effect which is created during electropolishing where some regions are treated at a slightly different rate than others. This 'frost' (or conversely pitting) can be created if residual organics are left on the part surface (blocks electrical current), if the grains of the metal surface are very large, or even if the part is left in the electropolishing bath for too longⁱⁱⁱ. Electropolish 'frost' may be acceptable depending on the final application, but some industries, such as semiconductor and medical devices, have strict 'no frost' requirements.

SilcoTek's Experience

Electropolish 'frost' can exist even when it's not visible to the unaided, naked eye. Microscopic changes in surface height are often responsible for 'frosting' and pieces must be viewed under magnification or with the help of enhanced light sources like white LED. With no light source, often, no 'frost' is visible on the electropolished surface, but when a white LED is shone on the surface, Figure 1 clearly shows some visible differences. The effect can be even greater under magnification.

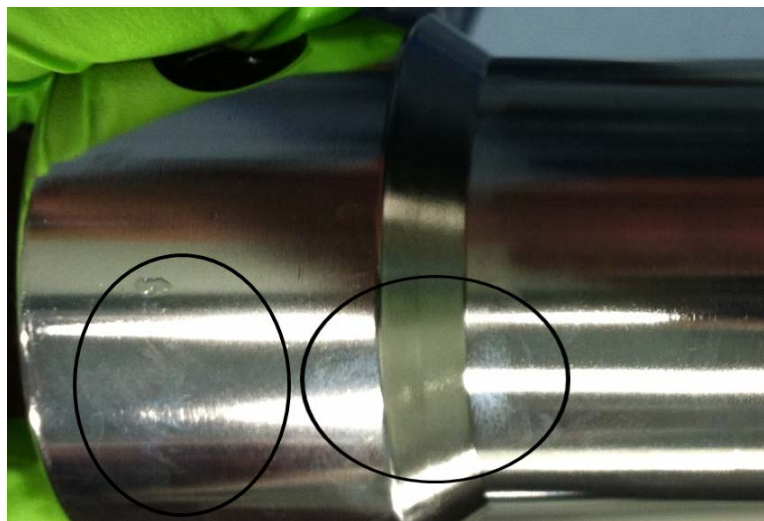


Figure 1 - Electropolish frosting with the aid of white, LED light

Electropolish 'frosting' is not always detected prior to SilcoTek's coating process. Because SilcoTek's pre-coating surface preparation does not affect the 'frost', the surface differences are only found after the CVD coating is applied. After coating, these parts display a distinctly different appearance shown below in Figure 2.



Figure 2 - Electropolish 'frosting' post coating without the aid of a white LED

It is important to note that the electropolish 'frosting' is not on or in SilcoTek's coating, but rather is an effect created by the metal surface finish. The 'frost' should not affect the coating performance within any application where electropolish 'frosting' is acceptable.

Recommendation

Part cosmetics are important for a wide range of end-user applications. SilcoTek recommends that electropolishing be specified to be free of 'frosting' for any parts coming into our coating processes where part cosmetics may be a concern.

ⁱ <http://www.delstar.com/electropolishing.html>

ⁱⁱ http://www.kepcoinc.com/downloads/Electro_Polishing/LC_cleaning-for-electropolishing.pdf