

# NEAP X.1 / X.2



Non-etching adhesion promoter for leadframes  
(based on silver adhesion promoter – AgPrep 26L)

Electronics

Functional electronic coatings

atotech.com

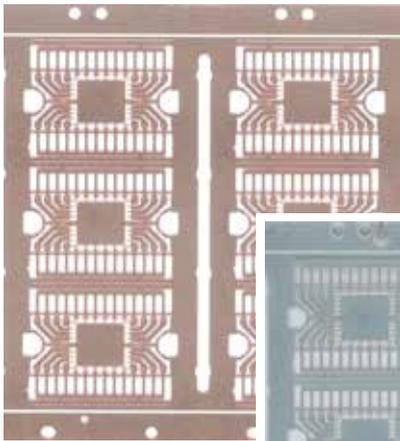
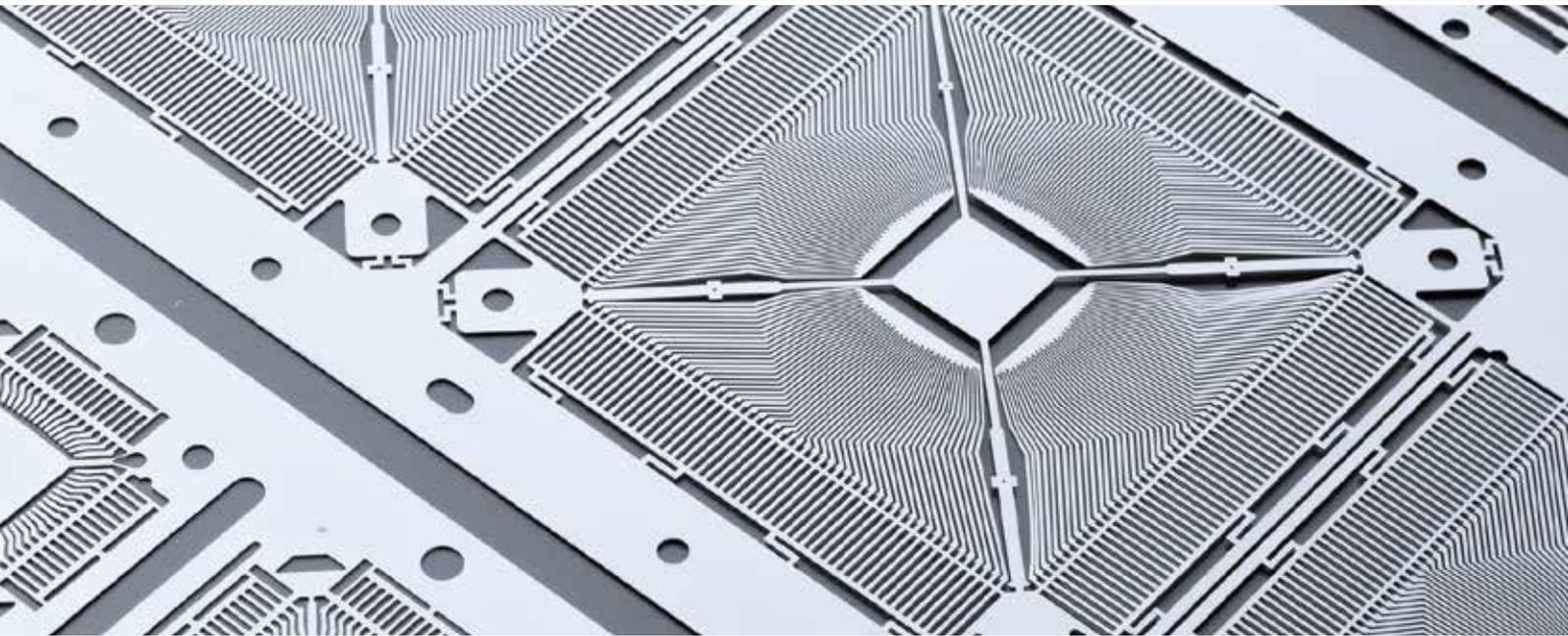


Figure 1: NEAP X.1 before treatment

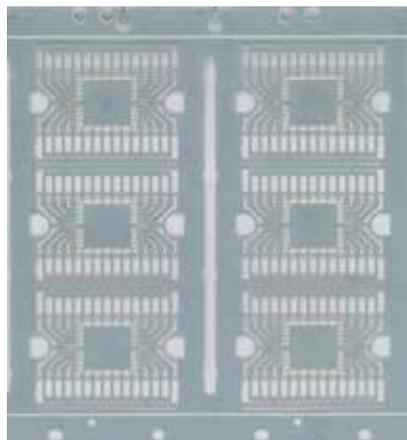


Figure 1: NEAP X.1 after treatment

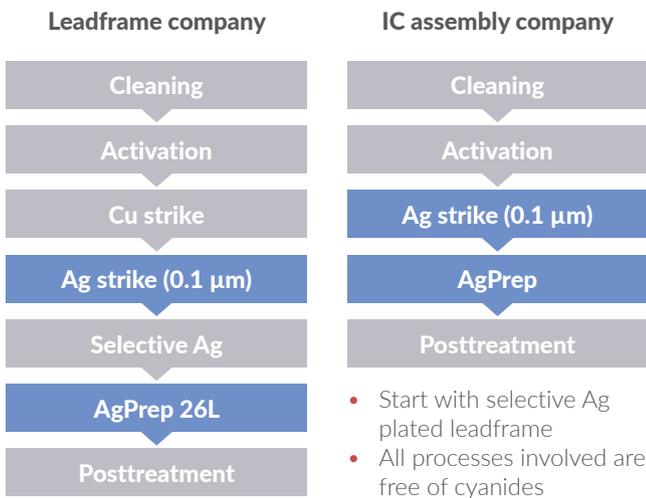
## Next generation adhesion promoter

Adhesion promoters for leadframes have been gaining popularity in recent years due to the necessity to overcome package delamination issues. Most of these adhesion promoters are based on improving mechanical bonding to epoxy molding compound (EMC) and die attach glue, through a metal surface roughening process or a rough metal plating process. However, due to the nature of the yielded rough surface on leadframes, various assembly problems had been encountered, such as epoxy bleed out during die-attach and difficulty in deflashing after molding. Hence, the drive for a new novel process has led to the development of NEAP X.1 / X.2.

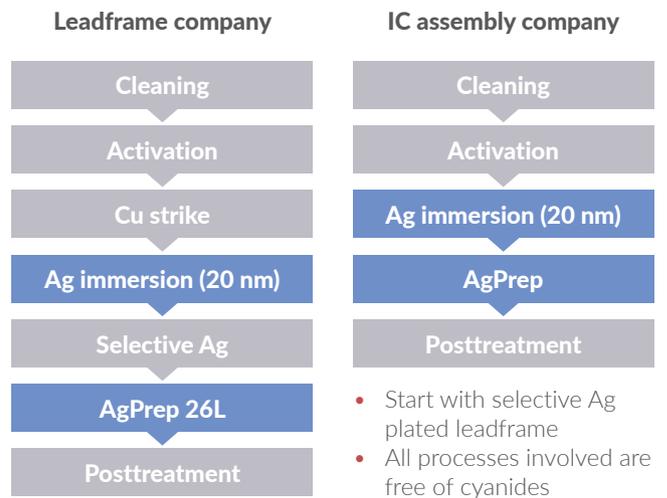
NEAP X.1 / X.2 is a simple process which can be easily “dropped-in” to the existing plating process of selective silver plated leadframes at the leadframe supplier sites. It can also be implemented in IC assembly companies as all chemical processes involved are “green” (free of cyanides), and thus no new / special waste treatment facilities are needed.

# NEAP X.1 / X.2 – A new novel adhesion promoter

## NEAP X.1



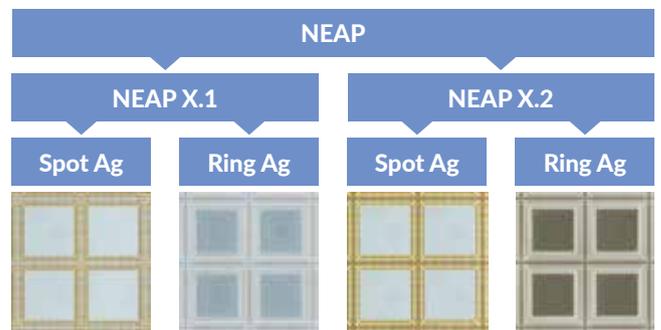
## NEAP X.2



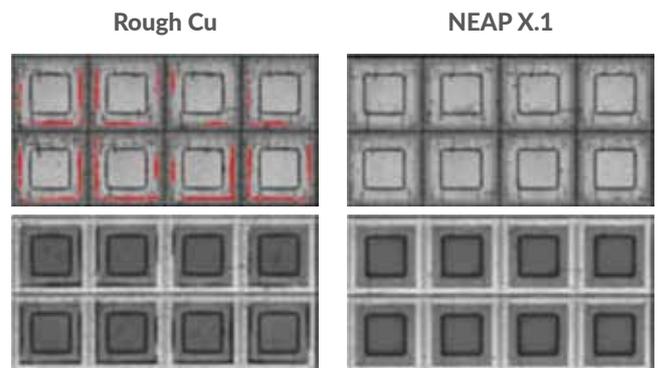
## Benefits

- Non etched process
  - No rough / powdery coating on Cu surface
  - Much better controlled EBO (Epoxy Bleed Out) during die-attach
  - No difficulty in deflashing after molding
- Unique adhesion promoter for Ag surfaces
  - Rough Cu leadframes still pose a high risk of delamination on the Ag area
- Excellent reliability performance
  - Better reliability than rough Cu under high thermal conditions
  - Meets automotive requirements, i.e MSL 1 + HTS, MSL 1 + TC
- Simple process flow
  - Drop-in for leadframe plating line → replacing the Ag back-stripping with AgPrep 26L
  - Available non cyanide Ag processes enable the incorporation in IC assembly companies
- Versatile and lower overall costs
  - Works well on spot Ag and ring Ag leadframes
  - Unlike rough Cu technology, the Ag plating area does not need to be minimized through expensive photoresist plating

## Appearance of various NEAP leadframes

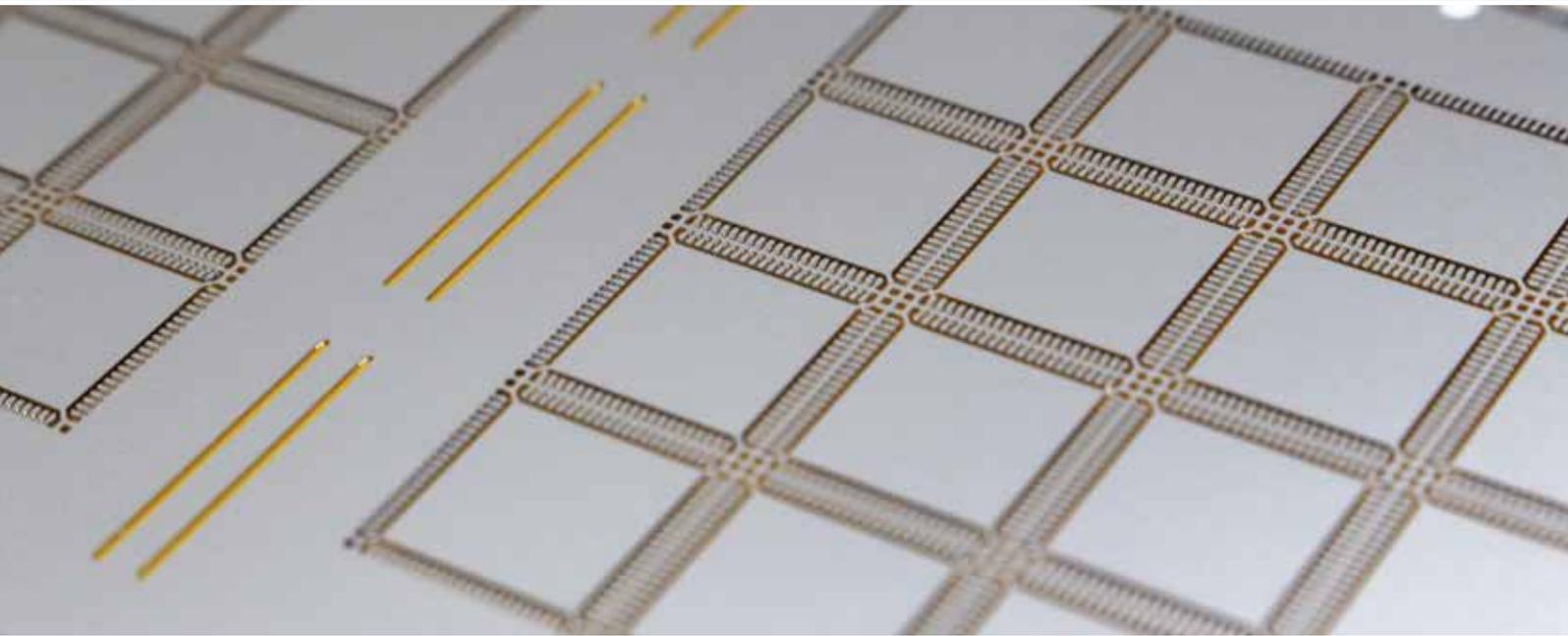


## Excellent reliability MSL 1 + HTS 1000 hrs @200 °C

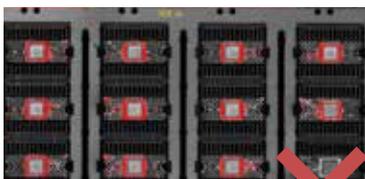


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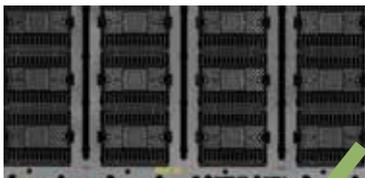




## The new NEAP assures excellent adhesion and significant cost savings



Without ppfPrep



With ppfPrep



### NEAP for pre-plated lead frames

Atotech's ppfPrep is a unique **Non Etching Adhesion Promoter (NEAP)** for lead frame applications. It provides excellent adhesion while significantly reducing costs. The simple, low-cost solution assures high performance and resolves the ppf IC package delamination issue.

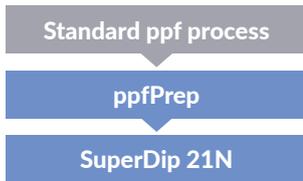
ppfPrep offers advantages in board level reliability (BLR) and does not require any tin plating. It thereby eliminates the wet-process. Furthermore, ppfPrep does not create any changes to the original topography of the ppf surface yet increases the adhesion of the epoxy molding compound to the ppf surface.

0

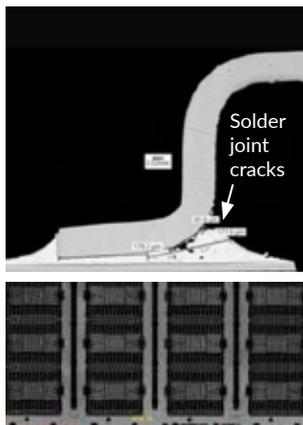
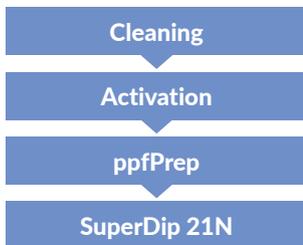
delamination @ MSL1

# ppfPrep – NEAP for pre-plated lead frames

## Leadframe company



## IC assembly company



Pic. 1: Solder joint cracks due to poor adhesion, without ppfPrep  
 Pic. 2: CSAM test show no delamination detected

## Process flow options

ppfPrep can be used along the standard process at lead frame manufacturing companies with additional tanks at the end of the line. It can also be used at IC assembly houses with a separate line. ppfPrep works best when combined with our Superdip 21N post treatment.

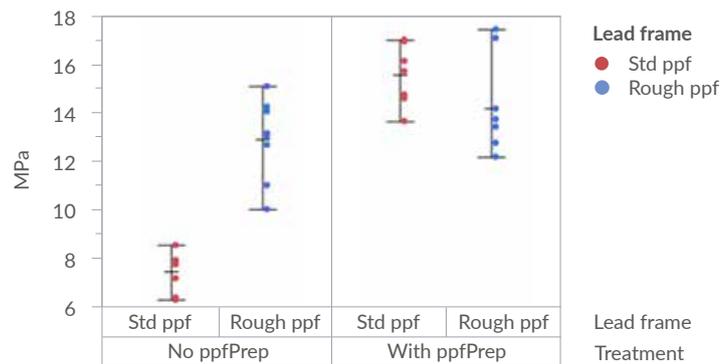
## Benefits

- Non-etched process
  - No rough / powdery coating on ppf surface
  - Much better controlled EBO (epoxy bleed out) during die-attach
- Unique adhesion promoter for ppf surface
  - Will help increase adhesion of EMC to the ppf surface
- Excellent reliability performance
  - 0 delamination from MSL 1 tests
- Simple process flow
  - Drop-in for lead frame plating line → additional 2 tanks
  - 4 step process for IC assembly company
- Versatile and lower overall cost

## Parameter

## Working range

ppfPrep concentration	300 ml/L (250 – 350 ml/L)
Temperature	45 °C (40 – 50 °C)
Treatment time	45 sec (30 –60 sec)
Current density	12 ASD (10 – 14 ASD)



Pic. 3: Std ppf showed better adhesion than rough ppf after ppfPrep treatment

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# Silvertech® RBH

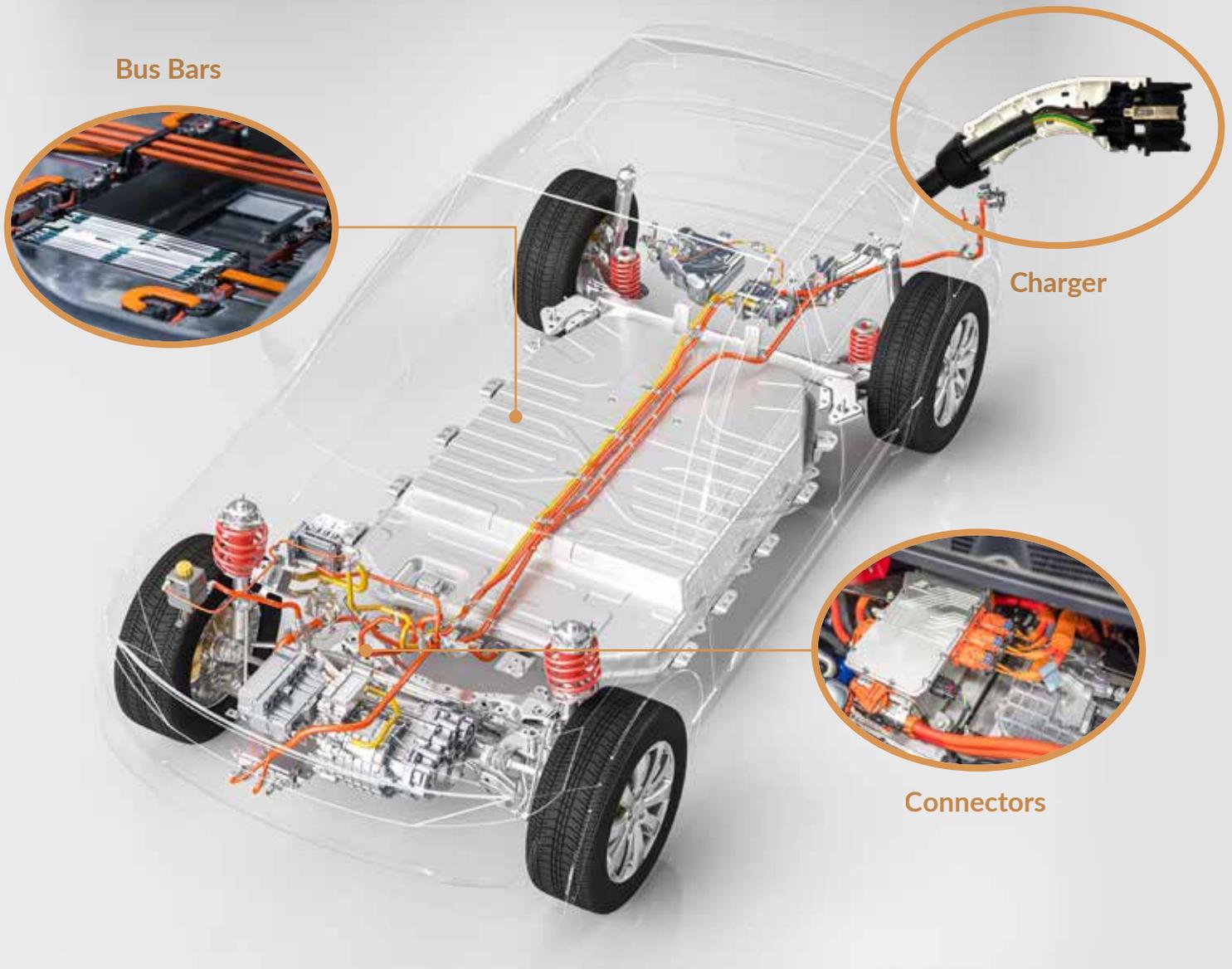
## Hard silver plating



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### Silvertech® RBH

Silvertech® RBH is a new plating process that deposits a hard silver layer on bus bars, connectors, and chargers. Its hardness of about 180 Hv and low contact resistance make it an ideal match for the needs of electrical vehicles. The process is designed to run in Rack and Barrel tools and exhibits an exceptional process stability. It can be combined with our Cr (VI) free anti-tarnishes to preserve its layer properties.

# Silvertech® RBH – Hard silver plating process

## Deposit characteristics of Silvertech® RBH

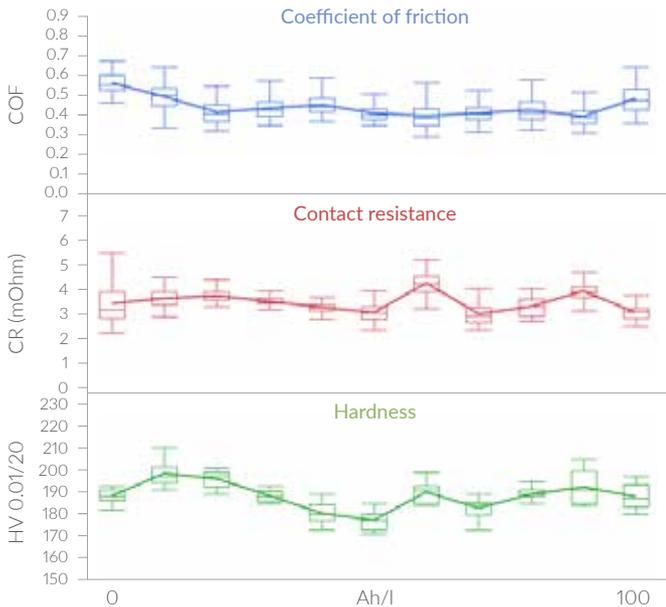


Figure 1: Deposit characteristics of a 35 µm Ag layer for fresh and aged electrolytes

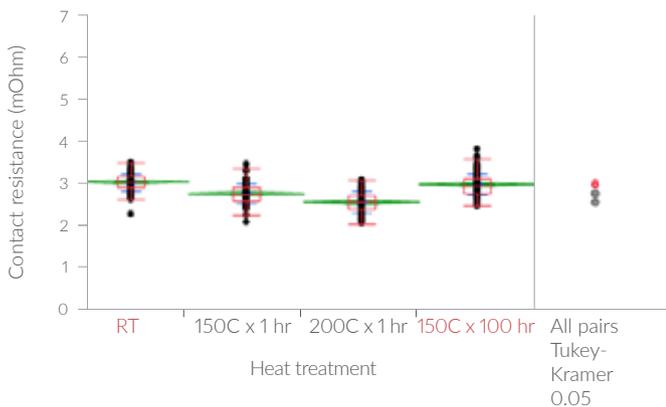


Figure 2: Contact resistance after heat treatment

## Exceptional process stability

Consistent deposit properties over the life time of a process is a must. Silvertech® RBH is fulfilling this demand in a perfect way. Be it hardness, contact resistance, or coefficient of friction, all these crucial parameters stay within a narrow range over a long period.

The fine grained microstructure results in a hardness of >180 HV<sub>20</sub> and ensures an improved wear off behaviour whereas the low contact resistance is the perfect match for the high voltage/power connections within the power train of e-vehicles. Moreover, the low coefficient of friction allows for low mating forces which is essential for multi pin connectors.

To maintain properties over a long period of application we propose to protect the silver surface with our Cr(VI) free anti-tarnish Argalin® XL.

## Temperature stability

Silver deposits have to withstand high temperatures during operation. Silvertech® RBH deposits withstand long periods at elevated temperatures without delamination from the underlying nickel or copper base material. It keeps its good contact resistance and low coefficient of friction and maintains a hardness value well above 120 HV<sub>20</sub> even after 1,000 h at 150 °C, a significant difference to pure silver deposits (60 HV<sub>20</sub>).

## Operating parameters and performance

- Current density: Up to 5 ASD
- Single additive system for simplified process control
- Hardness: 180 HV<sub>20</sub>
- Contact resistance : 3-4 mOhm, heat stable
- Purity: ASTM B700-20 type 3, grade B, D
- Appearance: Technical brightness
- Good solderability



# StannoPure<sup>®</sup> PF 10

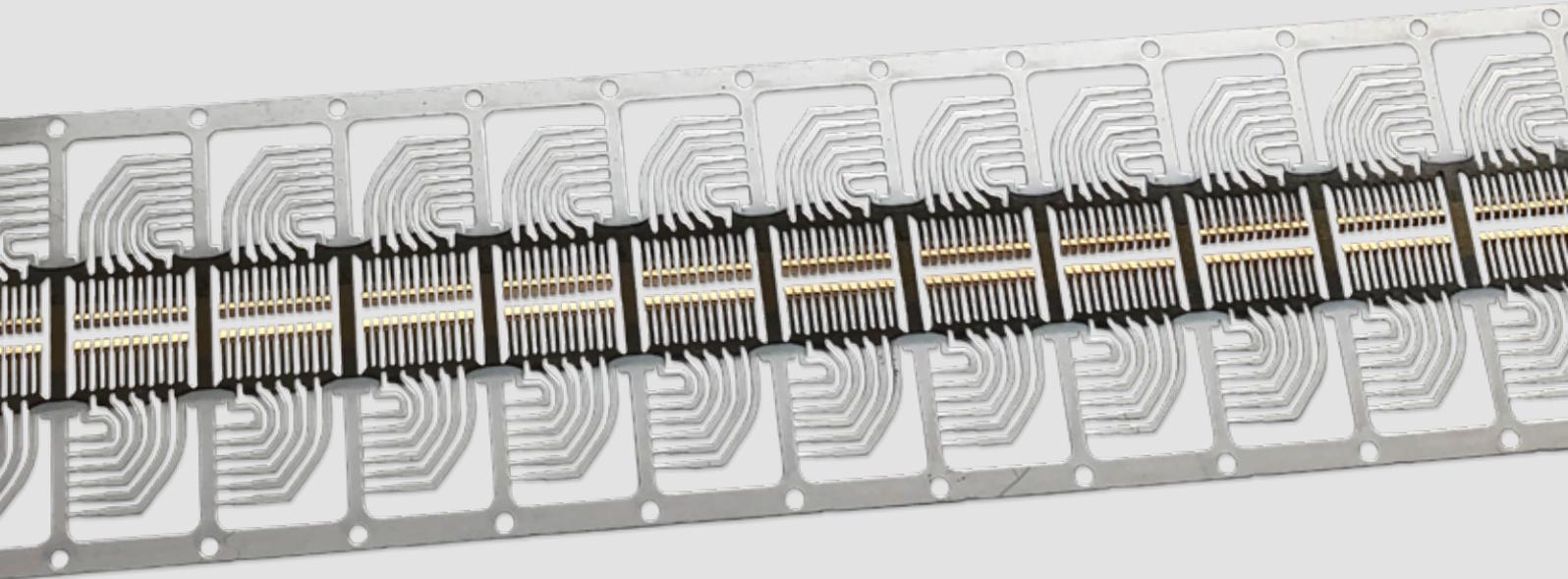
Electrolytic Sn process



Electronics

Functional electronic coatings

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## Green high speed tin process for lead frames and connectors with perfect coverage

# 100

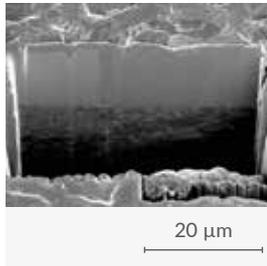
percent coverage

### Stannopure<sup>®</sup> PF 10

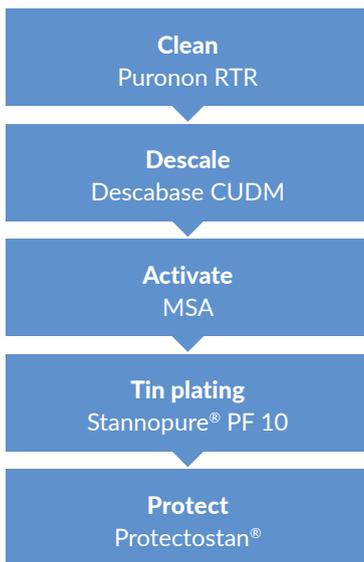
Stannopure<sup>®</sup> PF 10 is a high speed MSA based pure tin electrolyte for lead frames, connectors and wires. With its perfect tin coverage over the entire current density range Stannopure<sup>®</sup> PF 10 is designed to plate even the most difficult connector and lead frame designs. It is built on a new electrolyte suite that is free of BPA, NPE, PFAs and other critical additives.

Stannopure<sup>®</sup> PF 10 does not oil out even at high temperatures and deposits are perfectly solderable with a very low whisker propensity.

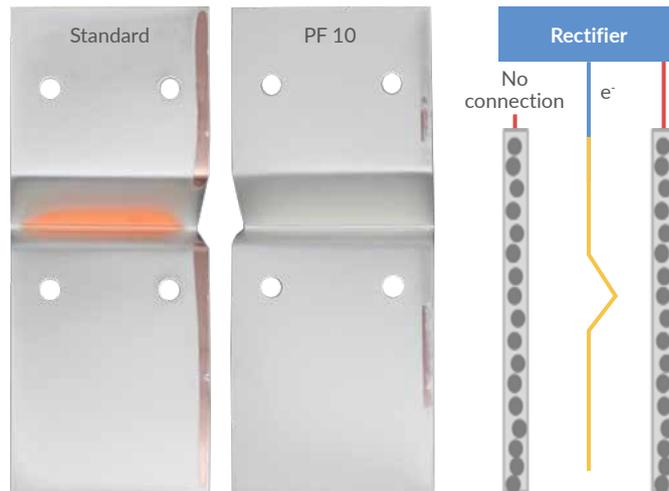
# Electrolytic Sn process



**Figure 1:**  
Large brick like tin crystals  
with a comparatively smooth  
surface



## Coverage test at 20 ASD



## Features and benefits

- Green process free of critical additives
- Low MSA
- No oil out
- Perfect solderability with all lead-free and lead containing solders
- Perfect coverage over entire CD range even at lowest CD
- Low whisker propensity
- Developed for all modern plating tools

