Vitronics Soltec

Information Sheet 062

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Wear resistant solderpot material for lead-free soldering

Introduction

With the use of lead-free solder, the common solderpot construction materials will show a corrosive wear in due time after being exposed to the lead-free solder.
The friction on pump and nozzle parts caused by the solderflow gives on these parts a more excessive wear.
These materials, which could often well be used for tin-lead solders, are now showing wear, which is mainly a result of the change in solder alloy and the use of higher solder temperatures.

An investigation was done to search for materials that are more resistant to this wear, so that the lifetime of these parts will be substantially extended, so that they do not need to be exchanged due to wear.

Test Conditions

A test in a running solderpot at a temperature of 400°C was chosen, which is well above the common process temperatures for lead-free wave soldering.
As solder the most commonly applied lead-free SnAgCu alloy was used.

Materials tested

Stainless steel AISI 301, 304, 316 and 321. Also Hastelloy, SST316-Ti alloy, Nicofer 6023 H, Nicofer 6025 HT and some cast iron samples were tested.
On non-of these samples a coating was applied.

Coatings tested were heat resistant alkyd based paint and galvanic wear resistant coatings.
Also vapour deposited coatings were tested like CrN and TiAlN.

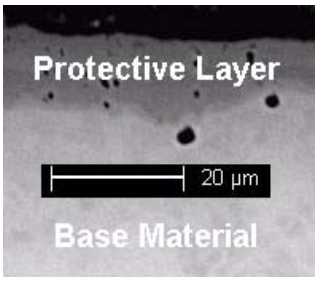
Finally diffusing coatings like the QPQ Nitride and a Cr_xC_y coating were compared in this test.
The base material for these coatings was low carbon construction steel.

Test results

From all materials and coatings that were tested only cast iron, and steel coated with a diffused Cr_xC_y layer, did pass the test without showing any wear after more than 6000 hours of testing.

One of the failing samples

Sample that passed the test



Cross Section of passed sample

Conclusion

The best protection was established with a ceramic Cr_xC_y layer with a layer thickness of 3 - 30 micron and a hardness of about 2000 Vickers.

This layer does not only protect against wear, but also adhesion of solder or dross is much lower due to the low friction coefficient of this layer.

These wear resistant parts are replacements for the standard parts. This includes pump and nozzle parts.