ABSTRACT

Abstract Electroplating in devise making. Development of technological process of applying tin-lead alloy for printed circuit boards. Title

Braichenko S.S.-Kyiv: «KPI», ChTF, group EC-31

Diploma project , 2017. Number of pages –102, tables –19, figures –4, references -12

In this project the technology of application of coverage shiny tin-lead alloy from tetrafluoroboric electrolyte with additives Limeda POS-1 and Syntanol DS-10 on printed circuit boards for long-lasting solderability and corrosion resistance.

Covered part - conductive pattern The part is used in atmospheric conditions with temperature 15-70◦ and relative air humidity no more than 70%, doesn`t give in tofriction and has to have high corrosion resistance.

ASTM61A protects against corrosion due to the formation of a layer of oxides on its surface.

Deposition tin-lead alloy is held in tetrafluoroboric, pyrophosphate, perchlorate, sulfamate and phenolsulfonic electrolytes.

As electrolyte for plating was chosen tetrafluoroboric electrolyte with additives Limeda POS-1 and Syntanol DS-10 with the main advantages - a relatively high dispersion power and high fluidity and a wide range of current density of 2-5 A / dm^2.

The composition of used elerctrolyte

1. Tin (II) tetrafluoroborate (metal) 12-18 g/l
2. Lead (II) tetrafluoroborate (metal) 5-8 g/l
3. Tetrafluoroboric acid 180-200 g/l
4. Synthanol 6-7 g/l
5. Brighteners Limeda ASTM1 0,4-0,5 g/l

In this diploma project before applying tin-lead alloy ASTM61A is only a stage in the activation HBF4 for 0.5 - 1.0 min. at a temperature of 18-25 ° C. Washing in water is carried out in order to prevent the ingress of water into the electrolyte for the application of tin-lead alloy.

Mode electrolyte

The temperature of 15-30 ° C. In these limits the quality of the coating and the electrolyte performance independent of temperature. Raising the temperature above 30 ° C promotes faster oxidation of tin (II) and organic additives.

The acidity of the electrolyte is pH <1. The pH is usually not measured and maintained tetrafluoroboric addition of acid.

Mixing of the electrolyte by moving cathode rod with a linear speed of 0,8-1,6 m / min. Mixing compressed air is not allowed due to oxidation of tin (II).

Cathodic current density of 4.2 A / dm^2 (optimum 2.5-3.5 A / dm^2). The density of the anode - current is 4 A / dm^2.

Coating deposition rate of about 1.2 microns / min. at a current density of 2.5 A / dm^2 and 1.7 microns / min. at a current density of 3.5 A / dm^2

Technological stages

1.Assembling

2.Activation

3.Deposition of tin-lead alloy

4.Capture

5.Jet washing

6.Dryer

7.Dismantling

Quality control of electroplating

Coatings that precipitates out of the electrolyte additive Limeda -1 defies whisker growth differs softness, flexibility, a very small amount of organic impurities that can efficiently carry out a transaction liquid reflow and infrared reflow method of heating.

The exterior coating that is deposited - from brilliant to brilliant with shade of milk. The heterogeneity of brightness and intensity milky hue associated with the heterogeneity of mixing the electrolyte in some areas of the PCB, especially in areas of varying density circuit pattern and not a defect.

Automation

In automated systems of temperature measurement is based on the physical properties of bodies functionally related to the temperature of the latter. The process of applying tin-lead alloy is carried out at room temperature 15 ... 30 ° C. Therefore, the process does not need to conduct temperature measurement.

In the process of applying the alloy may change the composition of the electrolyte, its volume and pH. The volume of the electrolyte may vary in its spraying during unloading of parts. Therefore, to automatically maintain a constant electrolyte composition, its level and pH.

Equally important parameter of the process of applying tin-lead alloy is cathodic current density. When it is reduced to decrease the rate of deposition of metal, and an increase in coverage is spongy and powder.

In the economic-organizational calculations the department was calculated as an object of the economy: the optimal type of movement of labor objects, the number of employees and their schedule, the technical and economic indicators of production were calculated:

- the cost of coverage is 90 UAH/pieces;

- investment 2 686 943 UAH;

- profit is 5 219 404 UAH/year;

- profitability 263,5%;

- period of return of investments 0,51 years.

Recycling

This method of recovery and recycling of tin, lead and tetraftorboratnoyi acid is that The bath is rebuilt in the bath of regeneration by converting it into the galvanic bath, which periodically (once a week) or permanently from the solution electrochemically removing tin and lead, and tetrafluoroboric acid remaining sent for recycling to the bath activation or disposal. Part of the electrolyte bath tub returns to capture deposition tin-lead.

Electrolysis in the tub-trap regeneration is performed at a current density of 0.06 - 0.12 A / dm^2 after accumulating therein tin and lead in amounts from about 0.1 to 0.2 parts of amounts that are electrodeposition in the bath. Control of removing metals conduct analytical determination of lead. If electrolysis is carried out periodically, intermittently, reduce the concentration of lead each time to 0.1 g / dm^3. With continued conducting electrolysis of lead concentration is maintained at 0, 5 g / dm^3

Wastewater generated during electrodeposition coating alloy of tin-lead, sent to the wastewater treatment plant, where they are collected in a separate container and subjected to purification.

Cleaning is carried out by precipitation milk of lime reactor for deposition at pH 8.5 - 11. After the addition of lime milk wastewater is kept in the reactor for the deposition of at least 10 hours with continuous stirring. During this time there hydroxide precipitation of tin and lead. The resulting precipitate filtered. If the total wastewater company in their number exceeds more than 10 times the amount of the filtrate, then the filtrate can be connected to general effluents without further

purification, because after diluting the content of tin, lead and fluoride will not exceed the MPC norms.

Keywords: electroplating, tin, lead, galvanic baths, stationary electroliser, voltagebalance, electrolysis, wastewater, printed circuit board.