Common defects and solutions of FR-4 (CCL)

FR-4 is the largest amount of CCL, The most widely used product,Its quality not only affects the CCL plant itself, but also seriously affect the processing rate of PCB processing and assembly of electronic products after the pass rate.Therefore, to understand more of the FR-4 CCL common defects and solutions on how to prevent defects, and how to solve defects after the defect occurs,it is the problem which the CCL factory extremely concerned about , but also each PCB factory concerned about .

FR-4 CCL common defects, most are the appearance and non-electrical performance defects.As the substrate quality problems must be corroded to the copper foil or made after the PCB board can be found, if this time to deal with,it has caused great losses.Therefore, we must find in advance, do not let these defective products factory, do preventive measures, in the production process to prevent these defects,it is the focus of various CCL work. On the FR-4 CCL production and use of common defects in the causes and countermeasures described below.

Thickness tolerance

Definition of nouns

Thickness Overlap refers to the difference between the actual thickness of the CCL and the nominal thickness of the product. The current CCL industry are using IPC thickness standards, but there are many CCL product thickness deviation can not all meet the IPC standard three levels of tolerance, improve the accuracy of CCL thickness still need to make unremitting efforts.

Substrate tolerance damage

CCL thickness tolerance hazards are:

(1) CCL thickness tolerance, more common in the middle thickness of thin, or side of the thick, thin side of the situation. It will affect PCB processing(Such as when the PCB board to open V-groove, the substrate thickness will affect the depth of slotting, substrate folding, etc.)And electronic components such as surface mount

(2) For the precision printed circuit board and a gold-plated printed plug (commonly known as the gold finger) of the PCB board, the thickness of the machine will cause the machine when the plug tightened, the formation of poor contact, affecting the performance of electronic devices.

(3) For multi-layer printed circuit board, the thickness of ultra-poor accumulation may cause the whole multi-layer board thickness caused by waste generated.

(4) This can not meet the test platform and other high-precision products on the thickness of the thickness tolerance requirements.

Thickness tolerance caused by the reasons

(1) adhesive sheet resin content fluctuation range is too large. In the case of normal flow of plastic, adhesive sheet resin content fluctuations and laminate, CCL thickness deviation is

proportional to. The greater the fluctuation of the resin content of the adhesive sheet, the greater the variation range of the thickness of the CCL thickness, and may exceed the allowable range of variation of the standard value. With this resin content distribution uneven prepreg laminated multi-layer PCB, a serious impact on multi-layer PCB thickness accuracy.

(2) hot plastic molding too much. Due to the loss of resin, CCL and multilayer PCB thickness is thinner and may be lower than the standard allowable range, and can easily lead to the middle of the thickness of the surrounding thin case.

(3) Substrate (glass cloth) improper selection. For some thickness of the product, because the adhesive sheet used in the substrate is too small or low thickness, to achieve a certain thickness of the product by adding resin content to solve.However, the compressibility of the substrate (glass cloth) is small, the compressibility of the resin is relatively large, and the resin is flowable in the molten state. Hot plastic molding when a little flow of plastic products will appear below the thickness of the standard thickness range.And, because the greater the content of semi-cured resin sheet, hot plastic molding when the corresponding increase in plastic, but also increase the product white corners, molding process even a "skateboard" accident.

(4) When the thickness of the copper foil changes, there is no time to change the different resin content or by different standard substrate adhesive. Because 18 μ m, 35 μ m, 70 μ m copper foil thickness difference is not small, plus single-sided copper cladding and double-sided copper and the core plate (no copper foil substrate) the difference, if not timely change the type of adhesive , Will also cause CCL thickness tolerance.

(5) If the thickness of the substrate is not uniform, the fluctuation range is too large, it will cause the substrate or laminated PCB board thickness fluctuations.

(6) On the glue machine measuring roller machining accuracy, poor installation accuracy, so that the uneven distribution of binder resin content, affecting the substrate thickness uniformity.

(7) The solid content of the glue is changed during the gumming process. For the glue machine without viscosity control device, with the solvent evaporation, glue liquid content gradually increased, fixed in the metering roller gap conditions, the adhesive sheet resin content becomes larger, resulting in thick substrate. Some factories are used to add time to the plastic tank to add quantitative solvent approach, this approach makes the solid content of the liquid was concentrated when the dilute state, the consistency is not very good;Since the solid content of the glue is linearly related to the viscosity of the glue, the viscosity change of the glue is linearly related to the temperature. So must be in a constant temperature control glue viscosity, in order to achieve effective control of the liquid solid content purposes.In addition, the glue tank for the plastic structure is also very critical, such as the thickness of the adhesive sheet, such as: the middle thick, thin on both sides; the middle of thin, thick side of the side or side of the thin side of the situation and most of the plastic and plastic structure There are relationships. And some factories in the production process, depending on the size of the adhesive sheet resin to adjust the size of the gap, this approach, due to the actual production every 1 to 2 hours or even longer to detect the technical parameters of a bonding sheet, So it is difficult to achieve the consistency

of the quality of the adhesive sheet (including resin content consistency).

For the glue-filled system, if the resin circulation system and the plastic tank structure is unreasonable, the filler in the glue layer is layered and precipitated, resulting in the uneven distribution of the resin or the uneven distribution of the packing.

(8) laminating machine hot plate parallelism, flatness accuracy is not enough, resulting in uneven substrate thickness.

(9) Hot plate pressure distribution uniformity is not enough, will also affect the substrate thickness uniformity.

(10) Hot plate temperature distribution is not uniform, the temperature of the local adhesive sheet curing process fast, low temperature of the local resin curing process is slow, different curing process caused by different substrate glue, but also lead to substrate thickness uniformity is not good, and because of curing The process is inconsistent, the product stress caused by large substrate warpage.

To prevent the thickness of the tolerance measures

CCL thickness tolerance is a comprehensive problem, from the substrate, process technology, equipment and other aspects of comprehensive management.

Substrate selection

For the relatively high quality requirements of the product, you must choose a better thickness uniformity of the glass cloth.

Control the resin content of the adhesive sheet

(1) Control the thickness of the product by controlling the RC% deviation of the adhesive sheet or the individual deviation of each adhesive sheet (usually 3 g / m2 to 4 g / m2).

(2) Bonding piece RC% serialization: about the same type of glass cloth made several different adhesive tape. Such as 7628 cloth can make low-volume (usually RC% in 38% to 39%, do core material); in the amount of plastic (usually RC% in 40% to 42%, common material); (Usually RC% in the 46% to 48%, made of materials); high content of plastic (usually RC% in 46% to 48%, super thick material, etc. For 2116,1080, and other glass cloth can be this In this way, through the different resin content of the adhesive sheet with, you can get different thickness of CCL products, especially the thickness of the requirements of high clad copper products.

(3) For the PCB factory, you must use the various technical parameters are better prepreg.

Reasonable ingredients structure

Different thickness of the glass cloth each have a relatively good resin content range. Resin content is too small, the substrate surface dryness, electrical properties, chemical resistance decreased, the substrate easy to spend.Such as resin content is too large, hot glue when the flow of plastic, white side of the substrate is too large, and prone to the middle of the thickness of the

substrate around the thin and other quality problems, hot forming easy to produce "skateboard accident" (stainless steel plate shift) This problem must be noted when adjusting the thickness of the product.The thickness of the CCL is usually controlled by controlling the weight of the blank (commonly known as "feed weight"). In order to control the thickness of the product, but also have a good appearance. In the material can be used when the core material plus material method, if necessary, by adding conditioning material. For each specification product, it must be structured by a very clear ingredient.

Strict control when the hot plastic molding volume

To carefully control the thickness of CCL, the first precise control of the adhesive sheet resin content, and then hot compression molding strict control flow volume.

To strictly control the flow of plastic, should be based on the technical indicators of adhesive design of the appropriate laminated menu. If you can make each plate of the flow of plastic are controlled in the range of several millimeters, then not only the product thickness uniformity will be very good, white corner is also very small, to reduce the cost of production is very large.

Since the flow control of the substrate during hot press molding is related to the setting of the laminating menu, such as the setting of the pressure section, the selection of the high pressure point, the setting of the heating rate and the like, and is related to the resin flowability of the adhesive sheet. Big topic.

For the PCB factory, the appropriate lamination menu is set to control the multi-layer PCB pressure when the plastic flow, control the thickness of the product accuracy and to prevent an important part of the white corner.

Substrate from the flowers

Definitions

CCL from the flower (also known as dried flowers) refers to the existence of the substrate board and the surrounding resin is not very good fusion of white spots or small pieces of the spot, the situation can be linked into large tracts, which is more serious from the flowers. Slightly from the board is the emergence of some very light clouds, the majority also appeared in the middle of the board.

The majority of the substrate from the flower in the middle of the plate, which because the heat of the middle part of the plate than the small scattered, resulting in the middle of the plate curing process faster than four weeks, when the high pressure is relatively high in the middle of the middle part easier From the flower; another press in the long-term use of hot plate in the middle of the deformation is greater than the surrounding parts.

Substrate from the flower hazards

As mentioned above, the resin density of the substrate is low, and there is no fusing interface with the surrounding resin. It seriously affects the substrate's solderability, electrical insulation

and many other properties, and can not be used as genuine.

Substrate from the flower causes

(1) Adhesive sheet on the resin B-order percentage is too low (the performance of the bond in the GT value is very low, RF% is very small, very low resin solubility, commonly known as sticky film too old), with fingers folded sticky film Corner, FR-4 adhesive sheet is not brittle.

When the adhesive sheet is too old, most of the resin has been converted to C, the adhesive sheet has been converted to C-class resin has no longer melt, the density is low, there are many micro-pores, the formation of light scattering, so Showing white. Moreover, the resin has been converted into C-class resin can not be combined with the B-phase resin together, so the interface, so with its hot-pressed copper plate prone to white spots and dried flowers.

(2)Hot press menu is not appropriate.

① high pressure is too small, resulting in product density is not enough, for FR-4 products, usually its non-vacuum laminating unit pressure at 6MPa (60kg / cm2), vacuum laminating unit pressure at 3MPa (30kg / cm2) (vacuum reached 740 mmHg to 750 mmHg).

② high pressure time too late. If the adhesive sheet is heated in the hot press, if the pressure does not keep up with the time, when the resin is heated and has crossed the gel point into the high elastic state, then hit the high pressure has no avail, the substrate will still take the flowers.

③ low temperature heating time is too long, causing the adhesive film before the high pressure has entered the C stage, then hit the high pressure has no avail.

(3) the number of pad material is not enough or has lost flexibility, can not achieve a good buffer pressure, so that the pressure distribution and slow heat, so that the temperature distribution of uniform effect.

(4) adhesive sheet moisture absorption board is also prone to take flowers.

(5) by the different coupling agent treatment of glass cloth made of prepreg, the curing rate may be different, when mixing mixed, the substrate there is the risk of flowers.

(6) hot press temperature distribution is not uniform, if the same hot plate local temperature difference is relatively large, or different hot plate temperature difference is relatively large; or hot plate flatness is not enough, turn some of the longer years of use, and not Repair of the hot plate, the middle has been concave, resulting in hot products due to the middle of the product "undervoltage", so that the middle part of the product easy to spend.

(7) the substrate from the flower to prevent.

① control the good adhesion GT and GT distribution uniformity. When the adhesive sheet GT and GT distribution uniformity beyond the scope of the process, must be timely glue process. For already in use with adhesive, must be timely adjustment of the laminating process.

② When the laminated product has the following problems, you must adjust the laminated menu according to the technical specifications of the adhesive sheet.

(A) the entire furnace board appears to spend, check whether the adhesive sheet is too old or too high pressure and high pressure is too low.

(B) the outer board from the flowers, the more to the middle plate lighter or no, check the high pressure time is too late.
(C) the plate from the local flowers, check the low number of sheets and elasticity and flexibility of the menu is appropriate.
(D) Check the uniformity of the temperature distribution of the hot plate. It must be adjusted when there is a problem.
(E) Check the degree of deformation of the hot plate, there must be repair problems.

Substrate delamination

Substrate layering refers to the laminating product adhesive sheet between the adhesive force is not enough, under normal external force, will produce interlayer separation, or in the heat shock caused by interlayer separation.

Such defects are mainly due to excessive aging of the adhesive sheet, RF% is too low or at the same time RC% too low and so on. For such adhesive tablets, such as according to the normal laminating conditions, it is easy to produce layered. In particular, some special handling of substandard adhesive film factory, more prone to such defects. When found that the fluidity of the adhesive sheet is too low, it should be classified, re-set the lamination conditions, the most important is to heat up faster, pressure to early, for the extreme aging of the adhesive, to a high pressure, the product temperature Dicyandiamide reaction temperature to make up once pressure. Usually can still be pressed out of the product will not be layered, but such products can not be a class of goods.

Other causes of stratification are: the adhesive sheet resin content is too low, the adhesive sheet serious moisture absorption, laminating process over-flow agent caused by layer and interlayer resin content is too low. When the glass cloth coupling agent after the improper handling, resulting in some of the resin and glass cloth is not good, such as fisheye and the like, will cause the substrate layer; in the laminating conditions set, the temperature rise too slow, The pressure is too low, will also cause the substrate layer. For this type of stratification, usually for its causes can be found to solve the problem.

Substrate layering, white spots have a serious impact on PCB manufacturing quality, is absolutely not allowed to have.

Substrate white spot

The white spot of the substrate refers to the presence of some white spots on the substrate surface, and most of these white spots occur at the glass cloth crossing. White matter and white matter. Explicit white is the corrosion of copper foil, you can see the white spot on the substrate. Recessive white spot is normal in the substrate appearance of normal, only in the heat shock, mechanical stress or chemical treatment when the white spot.

The main white matter is the low content of the adhesive sheet resin, the effect of the treatment of the glass cloth coupling agent is not good, resulting in poor resin and glass cloth. Or laminated

menu is not appropriate (mainly for the heating and pressing time is not appropriate, most of the pressure time is late), the substrate has a micro-bubble dispersion residue, will produce similar white spots appear.

For the substrate in the heat shock, mechanical stress or PCB etching process and other chemical treatment occurs when the white spots, most of the substrate resin content is too low (may be too low content of the adhesive itself, or too much glue when laminated Resulting in low substrate resin content), the substrate in the hot pressing process is not enough due to curing.

For the substrate in the autoclave cooking and PCB process in the white spots, the majority of glass cloth and poor post-processing and substrate resin content is low, the glass cloth on the glue did not go through the pre-dipping bubble-related process, or resin formula heat resistance is not So good.

Substrate white line

Substrate white line refers to the substrate surface there are some white lines exist, most of these white spots occurred in the glass cloth lines. Relatively light when the substrate is around, serious into the inside of the substrate.

The white line of the substrate is mainly related to the low GT value of the adhesive sheet or the irrational control of the low temperature period during the hot pressing of the product. In this case, the lamination menu should be adjusted in time.

Substrate exposed cloth pattern

Substrate exposed cloth refers to the surface of the substrate part of the glass yarn resin content is low. The substrate cloth pattern is also dominant, that is, just the production of products on the substrate exposed cloth pattern; and hidden cloth pattern that is in the PCB processing process by the chemical or by thermal shock appeared.

The substrate exposed cloth caused by the substrate insulation performance decreased, seriously affecting the quality of PCB board.

The main reason for the distribution of the substrate is that the content of the adhesive sheet is low or the fluidity is large, and the laminating process is too much. There are also laminating process factors, which are mainly for the temperature rise and too fast, , Prone to the substrate dominant exposed cloth pattern.

If the substrate is not sufficiently cured at the time of hot pressing, or if the glass cloth is poor in the post-treatment process, the combination of the glass cloth and the resin is not good, resulting in defects such as white spot and exposed cloth when the substrate can not withstand etching or thermal shock.

Precautions: You can use the "surface material" and "lining" approach, so that the amount of surface material to properly increase and adjust the corresponding GT and RF% and other technical parameters, the product in the hot pressing to have sufficient curing temperature and curing time , Can prevent the phenomenon of cloth and improve the substrate resistance to

chemical and electrical properties.

Substrate impurities, black spots
Substrate impurity, black dot refers to the substrate surface with opaque or transparent impurities or black spots.
Substrate impurities, black spots for a variety of reasons, the substrate in the glue when brought into, or in the stacked material, the operating environment of dust pollution, the operator accidentally brought it into the product.

Substrate impurity, black spots in addition to affect the appearance of the product, at the same time may affect the substrate other performance.

To prevent this from happening, the glue machine oven cleaning and production environment must be done clean. The glue machine must be cleaned regularly, especially for the hot air type glue machine, the circulating hot air will be in the duct, the oven wall dust, impurities, rust, burnt rubber residue and other objects to the adhesive sheet, the formation of Impurities and black spots. For heat radiation type glue machine such defects are lighter, because the heat source mainly by heat radiation, but there are still weak air flow in the oven cycle to take away the oven exhaust gas and so on. But the oven wall, duct, etc. still have to regularly clean up in order to avoid bonding on-chip impurities, black spots.
The operator into the clean room to wear anti-dust clothing, the wind through the wind before the wind into the wind. Adhesive sheet in the stack, with foil must be prevented by dust, impurities contaminated. There are many CCL plant site selection specifically in the distance away from the road and better green and other relatively remote areas, the main purpose is to reduce the dust in the surrounding environment impurities.
In some factories with automatic return line, PCB factory will have the substrate impurity complaints, the main villa if the copper and some of the material, some need to be seen under the electron microscope.
Copper is mainly from the cutter is not sharp enough, and now many CCL plants have switched to tungsten alloy knife, and in a period of time after the timely replacement, to overcome the copper problem. As for the other types of impurities are mainly clean or clean environment is not good, automatic reflow line stack book is in the purification between the time. For general requirements, this facility should be perfect, but for high-demand PCB plants, it may not be enough because these impurities are visible under an electron microscope.

This situation is mostly clean room circulation system design is not reasonable; purification between the low degree of purification, or clean the usual cleaning is not good.

Copper foil if the rough surface is not doing well, it will produce copper powder transfer problem,

which requires the copper foil factory to actively cooperate with many plants to consider the use of low profile copper foil, it is high precision fine line PCB board needs, can also avoid copper Powder transfer problem.

Copper foil wrinkled

Copper foil wrinkle refers to the copper plate surface copper foil has different degrees of crease. Copper foil wrinkles can not be used for PCB fabrication.

Copper foil wrinkles in the manual overlap line and semi-automatic stacking line is more likely to occur, especially for the relatively thin copper foil, by hand, two people operating the pace is inconsistent, it may be wrinkled copper. In the semi-automatic stacking line, the process of stacking with a cleaning tape from the copper plate with the mirror between the sweep to take away the copper foil and mirror panels may exist on the dust, impurities. In order to improve the cleaning effect, the stack stage with two clean cloth belt. If you install the two cleaning cloth when the tension is not adjusted, or two cloth tension inconsistencies, may cause thin copper foil wrinkle situation. Therefore, for the stacking table sweep to always check its operating conditions and two cloth tension conditions, in order to avoid the emergence of copper foil wrinkles.

For thinner copper foil (18 μ m and thinner copper foil) during the lamination process, if the resin flow is too large, the copper foil surface will be wrinkled. Lamination occurs when the glue out of the edge of the copper foil, and copper foil products appear wrinkled, it should promptly check and modify the adhesive sheet technical indicators or modify the laminating conditions.

In the choice of copper foil, for relatively thin copper foil, should try to use THE copper foil. It has a high temperature ductility, to a certain extent, can reduce the production of copper foil wrinkles.

Plastic dot

Adhesive point refers to the copper-clad copper foil surface has a different size has been cured of the resin point.

As the glue point is already cured resin, it is corroded in the PCB process, the insulation between the lines will be serious. So there are plastic dotted copper can not be used for PCB production.

Copper foil on the surface of the main points in the foil, the edge of the adhesive sheet on the resin powder will fly to the air, and then fell to the copper foil caused by the surface. Copper foil on the surface of the plastic plate in the PCB before the brush is not brush off, because the adhesive point on the copper foil is very strong. In the etching solution, it is etched away, which will affect the line between the insulation effect. Therefore, it is necessary to prevent the presence of such defects.

Copper foil on the surface of the main points in the foil, the edge of the adhesive sheet on the resin powder will fly to the air, and then fall to prevent the production of plastic spots, the most effective way is to each adhesive sheet dust removal edge treatment , PCB factory in the production of multi-layer board, the amount of semi-cured film relative to the CCL plant is much less, each piece of semi-cured film area is also much smaller, so you can implement each semi-cured film dust removal edge processing. There are also some CCL factories using the adhesive sheet for dust removal and edge treatment. But for no treatment of these conditions manufacturers, as long as the strengthening of environmental sanitation, to strengthen the effect of artificial edge.

In the cut copper foil and stacking ingredients, the use of back copper foil to the process, but also to reduce or eliminate the effect of copper cladding surface.
For the use of automatic return line production line, this situation is very small, automatic return line production line products A-level rate of most can reach more than 99%.

Pits
Pits refer to the surface of the copper foil with different sizes of subsidence pit.
Pits are the most common type of defects in CCLs, but such defects have a significant impact on the quality of PCB products, which may cause lines to be inaccessible or to pass.
Therefore, the occurrence of pits on the copper foil surface should be absolutely prevented. Most of the pits are associated with the cleanliness of the production environment and are also associated with defects on the mirror panel or defects on the mirror panel. As long as the full grasp of the mirror panel cleaning and protection, so that it does not exist may affect the quality of CCL appearance defects exist. For the automatic stacking line, although there are steel washing machine and a variety of preventive measures, but the actual production, stainless steel mirror panel is still inevitably attached to some dust, impurities. Some of these dust impurities are firmly attached to the mirror panel, steel plate washing machine can not brush. At this point, after the sub-board can be by the artificial, with 800 or less water sandpaper, along the steel plate gently wipe the impurities, and then wipe the dust with a clean white cloth to ensure that the appearance of laminated product quality The For deep scars, scars of stainless steel plate, should be polished in time. Production environment purification and protection of stainless steel plate is the main measure to prevent the pit.

Pinhole
Pinhole refers to the copper foil with fine voids.
Pinhole is caused by defects in the copper foil itself, after the glue, the glue will penetrate from the pinhole parts of the copper foil, brush brush can not afford, etching can not afford to die. So pinholes are never allowed to exist. Copper foil feed inspection can be used kerosene infiltration

method to check the pinhole: the kerosene brush with a brush in the copper foil smooth, and then coiled the copper side down for a few minutes, check the copper roughening surface, if the needle Kong Kong will have obvious signs of kerosene infiltration.

Copper foil oxidation

Copper foil oxidation refers to the surface of copper foil by air oxidation and discoloration occurred.

Minor copper foil oxidation, in the PCB production, most can be brush board machine brush off, so a slight oxidation will not affect the PCB product quality, but should also try to prevent. Copper foil serious oxidation may cause PCB production is not easy to clean, for these copper foil can not be used for CCL production.

One reason for the oxidation of copper foil is due to the poor oxidation resistance of the copper foil itself, causing the copper foil to be oxidized during the stocking process or being oxidized during the hot pressing process. Also in the course of the operation there is water or sweat falling on the surface of the copper foil (such as the operator did not wear gloves or gloves too thin) caused.

As the inventory conditions for copper foil oxidation have a certain impact, the warehouse should have temperature and humidity control. There have been some copper foil inventory process because of static electricity and black spots, so need to do copper foil inventory conditions management.

In order to prevent the impact of the process of sweating, the operator should wear plastic film gloves or plastic gloves in white jelly gloves.

Copper foil highlights

Copper foil highlights refers to the surface of the CCL some sporadic distribution of different sizes of bright spots, most highlights are small, but sometimes some bright spots larger, up to 1mm ~ 2mm in diameter.

Copper foil has a bright spot, the surface of the antioxidant layer has been destroyed, and the formation of a significant reflective point. In the IPC-4101 standard, there is no "bright spot" in the surface defect of the CCL, but the customer is not welcome to the "bright spot". First, the bright spot due to the oxidation layer has been destroyed, the product in the storage of the point is easy to be oxidized or even the formation of rust, the PCB manufacturing has a negative impact. For larger bright spots, where the copper foil may be thinner than other places, the same will affect the PCB manufacturing quality.

The production of copper foil highlights is mostly related to the colloidal particles on the surface of the adhesive sheet. There are hairiness and defective glass cloth in the glue, the adhesive surface will form some of the size of the "rubber particles". When the copper foil is covered on the adhesive sheet, there are some localized particles.

Once the friction (between materials or between the material and the stainless steel plate friction), these convex part of the copper foil surface oxidation layer may be erased and show purple highlights. In this regard, we wrapped with copper foil into the mirror plate on the friction plate, you can see the copper surface appears a number of purple highlights. In order to prevent the occurrence of bright spots, in addition to the requirements of raw materials suppliers to provide glass cloth to minimize hairiness and defects in the overlap operation and lamination operation, should be standardized operation to reduce the bright spot:

In the production of friction parts have to make the friction to reduce, such as the superposition of stainless steel plate stacking action to light. Will be "stacked" into the storage rack, from the material storage rack will be "stacked" into the laminating machine and other processes, push-pull mechanism to have slow - fast - slow operation mechanism, and the operation to be smooth, Because the emergency start and emergency stop will cause the steel plate and copper foil produce strong friction and produce bright spots, serious product will be dislocated and lead to other defects after the production. In addition, if it is found that the adhesive sheet surface particles are relatively large and relatively large, the adhesive sheet should be sandwiched between the other adhesive sheet, this structure does not affect the product performance, but can avoid the bright spot. Such as the batch of adhesive tablets colloidal particles are usually more than one side of the plastic side is also less, but also the surface by copper foil that piece of flip piece, in order to reduce the copper foil after the bright spots produced.

Light concave

The term "light concave" may be unfamiliar to some small CCL factories. Light concave this defect, because of its special, many manufacturers of its understanding is still not deep enough, and it belongs to the pit defects, and thus unfamiliar with this term.

In the exchange with peers, are aware of the existence of this defect, its performance is characterized by: copper foil surface has a small round bright spot, small diameter may be as small as sesame seeds, large can be slightly larger than mung bean. There is a half-moon bud-shaped depression next to the bright spot. This defect can not be accepted by the PCB factory. On this defect, some manufacturers named it as light concave. Some manufacturers call it fan (probably with its subsidence parts such as fan-shaped), some manufacturers called the copper under the hard points of the depression. That is, one of the factors that they consider to cause such a defect is that there is a hard object under the copper foil (such as adhesive on-chip impurities, colloidal particles, etc.).

The cause of this defect is completely different from that of ordinary pits. Ordinary pits are small pits that make the copper foil completely subsurface due to the external hard objects. But the light concave defects are generally considered to be related to chemical factors, copper is a hard thing under the incentive. When the adhesive sheet on a lot of particles, under pressure, CCL surface will produce many small bright spots, but not necessarily appear concave. It should be said that in the copper foil under the hard material and adhesive sheet in the hot pressing

process of water vapor or low molecular weight exclusion is the main factor leading to light concave production.

In the actual production, when there is light concave, may appear continuously, and some each board only one or two light concave, sometimes there will be many. When this situation occurs, it can be judged that there are some problems with the production process or the storage process. At this time should check the batch of adhesive sheet storage conditions meet the process requirements? Is the storage time too long? Is there a hygroscopic phenomenon? For the settlement of light concave, should first remove the quality of adhesive sheet. When laminating, the lamination conditions should be adjusted in time. In other words, the quality of the adhesive sheet and the laminating process conditions are two important aspects to solve the light concave, usually by adjusting the product when the vacuum time can effectively overcome or reduce the light concave production.

There are already a lot of CCL factory in the product before the vacuum method, for the prevention of light concave produce a significant effect.

Steel plate pattern.

Steel plate pattern refers to the copper plate on the surface of the copper plate pattern, this situation is also in the absence of copper foil on the laminate also exists. Steel-clad steel claddings have a certain effect on fine line PCB fabrication.

The stainless steel plate, like a mirror, exposes its surface defects to the surface of the copper foil, which is exactly the same as pressing the pastry with the mold. When the copper foil is relatively thick, its performance is not very prominent. When the copper foil is relatively thin, it is quite obvious. For steel plate defects Some CCL factories sometimes ignore it. Here refers to the steel plate pattern, mainly refers to the grinding plate, the coarse grinding sand with coarse sand, into the steel plate deep, and then the polishing process did not take these deeper lines of thread grinding, resulting in suppression of products, steel Foil surface also has the same lines. There is also a situation is grinding steel plate wave pattern caused by copper foil surface with wave pattern and so on. When these phenomena are obvious when it is not allowed. So the use of stainless steel mirror panels, maintenance, grinding should be strictly managed, strictly controlled.

Filler dispersion uneven problem

Uneven dispersion of the filler means that the poor appearance of the filler due to the uneven distribution of the filler can be seen on the adhesive sheet or on the substrate.

Adhesive sheet or substrate on the uneven dispersion of the PCB insulation properties and mechanical processing performance have adverse effects.

As the filler is used to reduce the cost and improve the performance of certain aspects of the product, such as improving the dimensional stability of the substrate, improving the moisture resistance and rigidity of the board, improving the substrate leakage resistance traces (CTI) and

reducing the thermal expansion coefficient (CTE) The So the filler in the FR-4 product applications more and more widely. As the proportion of filler is relatively large, easy to form a precipitate, the dispersion of filler in the liquid is not uniform and will inevitably cause the filler on the adhesive sheet dispersion uneven.

CCL plant is now commonly used in the volume of 5000L high shear to solve the filler and glue the full mixing problem. This high-cut reactor inside a high-speed dispersion machine, an emulsion head, a low-speed mixing mixer, the total power of 80kW. Among them, the real effect is the emulsion head, it is a double structure, the distance between the blade is very small, through the high-speed shear filler and resin emulsification effect. The other two agitators only play a secondary dispersion. But the diameter of the emulsion is only ten to twenty centimeters, a storage capacity of 5t of the plastic tank, relying on such an emulsion head, is unable to complete all the glue and filler emulsification effect. So after a high shear kettle glue placed not long, there is stratification or precipitation. In order to solve this problem, some plants on the main dipping tank structure has done a lot of improvements, such as the use of secondary emulsification settings, the use of relatively small tank of the emulsion tank, the first emulsion tank with double blade emulsion head, and then connected A three-layer blade of the emulsion tank to improve the emulsifying effect, this practice is worth experimenting.

In addition, the structure of the main dipping tank on the continuous improvement, reduce the bottom of the tank packing phenomenon, but also to achieve a certain effect.

Substrate curing problem is insufficient

Substrate curing degree refers to the product in the hot pressing process curing temperature and curing time is not sufficient substrate, this substrate in the PCB process is prone to quality problems.

The basic characteristics of the substrate curing degree of the main performance: the substrate mechanical strength decreased; substrate punching white circle white edge is more obvious, more burr edge; drilling into a poor bar, poor chip separation, hole wall smoothness; PCB processing process prone to The substrate heat resistance is reduced, such as the solder resistance test time is short, the curing of the board in the solder when the board, the board of the board The substrate will produce a "wire mesh" or extend from the solder joint many solder wire or white residue and other anomalies; substrate moisture absorption increases, the substrate CAF performance degradation, substrate dielectric properties (such as insulation resistance decreased); for comparison Thick substrate, drilling prone to skew and so on.

Resulting in the substrate curing degree of the main reasons there are hot pressing in the curing temperature and time is not enough. In some laminates and CCLs, in order to reduce the production cost, the curing time is shortened when the product is laminated. In addition, the heat resistance of the currently oriented polypropylene film is about 165 ℃. If this film is used as the release film, Then it can not use the temperature of 170 ℃, the temperature will appear

when the release of thin film sticky products and sticky stainless steel plate problem. FR-4 product curing conditions is best in 175 ℃ ~ 178 ℃ under the insulation 60min ~ 80min. Short curing time and low curing temperature will cause the substrate curing degree is insufficient.

To overcome the substrate curing degree is insufficient, need to control the product when the curing temperature and curing time, the use of relatively high heat resistance of the release film.

CAF (substrate ion migration resistance) problem

CAF (resistance to ion transport) is a PCB in a certain DC voltage, the anode copper ionization into copper ions, and along the glass fiber and resin interface to form a conductive pathway, when reaching the cathode lead to rapid decline in insulation resistance, which is Conductive ion migration.

CAF produced in two steps: (1) epoxy, glass cloth interface due to hydrolysis and degradation; (2) copper cation corrosion, conductive copper ions along the glass fiber migration.

Improve the substrate moisture resistance is to improve the substrate resistance to CAF important measures, including the increase in the coupling agent on the glass cloth treatment effect; glass cloth on the glue to improve the penetration of the substrate; the use of relatively high purity epoxy resin, resin In the organic chlorine and inorganic chlorine on the substrate resistance to CAF have a certain impact. In addition, to improve the substrate curing degree (with the product when the curing temperature and curing time-related) are to improve the substrate resistance to CAF important measures.

PCB processing on the process of washing time, the purity of water, mechanical processing of the heat and other effects on the substrate CAF also have a certain impact. So when found to be resistant to CAF performance of the substrate, it must also be checked to improve PCB processing problems.

Semi-cured film common defects and prevention

The prepreg is a major product sold in the CCL industry as a commodity. PCB factory in the multi-layer printed circuit board, it will be used to make the inner layer of the board together. Previously, a multilayer printed circuit board was provided with at least two prepregs for each layer so that the resin could fill the gap between the inner lines and to fill each of the prepregs with each other. However, with the increasing thickness of the multilayer and the need to reduce the manufacturing cost, it is not uncommon to use only one prepreg on each layer when the multilayer printed circuit board is pressed. Therefore, the quality requirements of the prepreg, the appearance requirements are getting higher and higher.

Semi-cured film surface smoothness is better, less particles, no fish eyes, lack of plastic, cloth cloth, impurities, black lines, colored lines, latitude and longitude can not be skewed.

Glue

Glue is the existence of semi-cured film on the surface of the "glue lumps", the main reason is that the glass cloth yarn joints, hairiness.Glass cloth in the weaving process of yarn breakage of the joints, highlighting the surface of the glass cloth, the glass cloth after the formation of plastic particles,This situation is more and then use the shuttle old loom (such as the arrow weaving machine), shuttle and glass yarn mechanical friction prone to broken yarn, and also prone to hairiness. Glass yarn is made up of hundreds of single filaments, and the mechanical friction between the shuttle and the glass yarn causes some of the monofilaments to break. Hairy feathers are also formed after the size of different rubber particles.

Rubber particles will affect the fine line processing, it should be avoided, the production of semi-cured film should be used when the quality is better glass cloth

Fisheye

Produced in the semi-cured sheet surface of the lack of plastic round spot, because it is round, shaped like a fish's eyes, so called the fish eye. Usually small fisheye than mung bean is also small, larger than peanuts also large. Its number in the area per square meter may be only a few, it may be a lot.

As the lack of resin of the fisheye part, affecting product performance, it must be prevented. Fisheye is mainly caused by the quality of glass cloth post-processing is not good enough, but also with the plastic glue on the glass cloth is not related to the permeability

Colored lines

One reason is that the glass cloth itself there are colored lines, most of which occurred in a shuttle loom,When the yarn breakage occurs,Artificial yarn is easy to pollute the fabric;when glass cloth stewed wax if the temperature is not high enough or the time is not long enough then residual stains and colored lines; because the cleaning work of the glue is not done on the glue process and then caused pollution.

Latitude and longitude skew

(1) the quality of the glass cloth itself. One reason is that the glass cloth itself is latitude and longitude skew, bump (cloth is not a situation) belonging to the quality of the glass cloth itself.

(2) cloth connector is not correct. In the process of joining the glue when the connector is not correct, the deformation of the substrate caused by latitude and longitude skew.

(3) the machine tension and the glue machine "s line speed is not set good. When investigated the deformation of the substrate in the process of the gums ,We found that the substrate in the immersion of glue is drying, the resin gradually transition to the "B" order (into the semi-cured state) process, the adhesive film becomes shrinkage,When the substrate is glued to the glue machine, the adhesive sheet is subjected to a pulling force and a resin contracting force, and the

two forces are opposite in direction. When the two forces exceed the substrate can withstand the degree, for the paper substrate, it will produce a broken, for the glass cloth substrate, it will produce deformation.

(4) When i was in the management of a paper-based CCL factory, due to the large tension on the plastic pulling machine , resulting paper broken often in the glue machine production process , the maximum number of paper breaking up to 20 times a day, each broken paper economic loss of RMB600 , also There are other losses. In addition to increasing the tension controller, Solving Tension Problems is also important to adjust the line speed of each section of the glue machine.The main thing is to let the screw machine on the line speed of the micro-decreasing, this approach is very effective, we did not increase the tensioner, only to adjust the screw machine on the line speed of the micro-decreasing, Reduced to only a few times per month. Now in many paper-based CCL broken paper is still the number of times, this adjustment method can be for their reference.

The above method is what we also used for glass cloth substrate production,in this special recommendation to the peer. it is also effective to reduce the deformation of the substrate, to prevent the latitude and longitude.

(4) Tension problem. During the production process, the tension of the winding device should be constant, because with the increase of the winding diameter, the winding speed will be linearly reduced, and the constant tension can ensure the quality of the semi-cured film to avoid the occurrence of defects such as tightness and crease. On the plastic machine to guide the roller level, vertical to adjust the good, winding volume core to have a higher accuracy is a prerequisite.。Winding process operator to track the observation, the timely removal of substandard goods. For better-performing plants, you can apply the CCD prepregs to the appearance of the inspection instrument, for the appearance of defective prepreg, it will automatically record and alert the operator promptly for processing.The quality of the glass cloth produced by the prepreg is higher than that of the glass cloth with the production of CCL, and the production process conditions are different from the production of the adhesive sheet in order to obtain the higher quality factor of the prepreg.

For relatively thin prepregs, such as the following thickness of 1080, should be produced in the oven with lower and low tension system.