Electroless Ni-P Plating having Excellent Bending Resistance (For Isolated Circuit Board)

『ICP Nicoron FPF』

Recently, in accordance with the trend of minimization or lightening weight of mobile phone and electronics components, the demands to flexible board (FPC board) has been enhancing remarkably. Though electroless Ni-P/Au plating has been applying widely as the final surface treatment of the manufacturing process of FPC board, in case of application of bending at assembling step or others, crack forms on not only Ni-P plating part, but also copper circuit part owing to big difference of the ductility of Cu and Ni-P, and disconnection of wire may occur.

Okuno Chemical Industries Co., Ltd. developed new plating bath "ICP Nicoron FPF" which gives Ni-P plating film having excellent ductility

Background of Development

Electroless Ni-P/Au plating has been applying widely to solder bonding or wire bonding as the final surface finishing for the electronics boards. Printed wiring boards are classified widely into ceramics, rigid, FPC and others. At Okuno Chemical Industries, we have been devoted ourselves into development of processes to obtain electroless Ni-P/Au plating having necessary properties to each substrate.

Though FPC board is thin and has ductility, in case that electroless Ni-P plating or electrolytic Ni plating on the Cu circuit on FPC board, cracks will form on not only Ni-P plating part, but also Cu circuit and disconnection of wire will occur. Especially, in case of board for liquid crystal driver mounting or others, as the wiring is extremely fine and it will be bent at assembling, such kind of defect has been increasing.

Development Concept and Feature of ICP Nicoron RPF

We have been devoting ourselves into development of electroless Ni plating solution for FPC board through it before, and developed and put into the market high P type electroless Ni-P plating solution "ICP Nicoron SOF Series". The deposition film from this bath has not only bending resistance, but also high corrosion resistance. However, we found some subjects on this product. For example, it is rather hard to gain thick film at immersion gold plating, and compared with Cu substrate before plating, disconnection of wire is apt to occur, though it gives better result than the conventional electroless Ni-P plating film at MIT Test (repeated bending test).

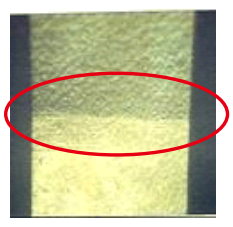
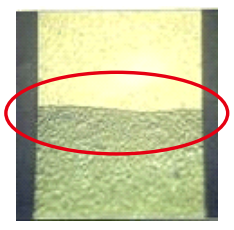
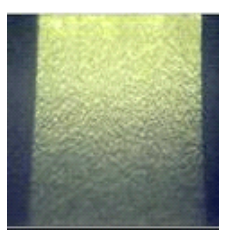
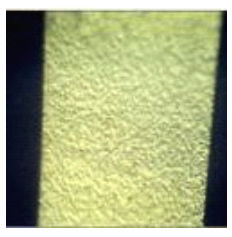
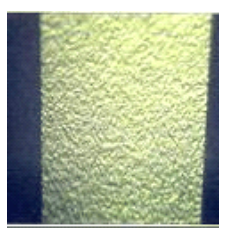
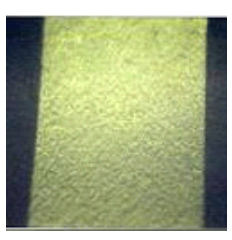
Under this background, we developed middle P type electroless Ni-P plating solution "ICP Nicoron FPF" which has good deposition effect of immersion Au plating and equivalent degree of bending resistance to Cu substrate.

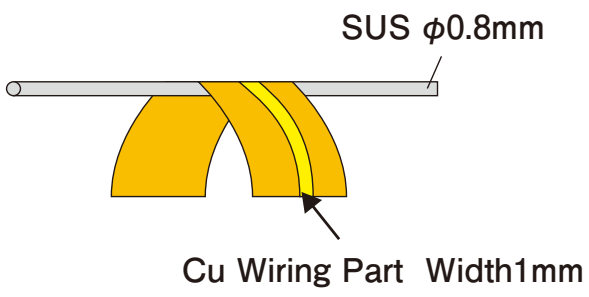
Property of ICP Nicoron FPF

【Bending Resistance】

Winding Test

As the evaluation method by winding test, we evaluated the bending resistance of the test specimen applied electroless Ni-P/Au plating (Ni : 1 ～ 5 μm) on FPC board (Cu pattern) by winding it on SUS bar of 0.8 mm in diameter.

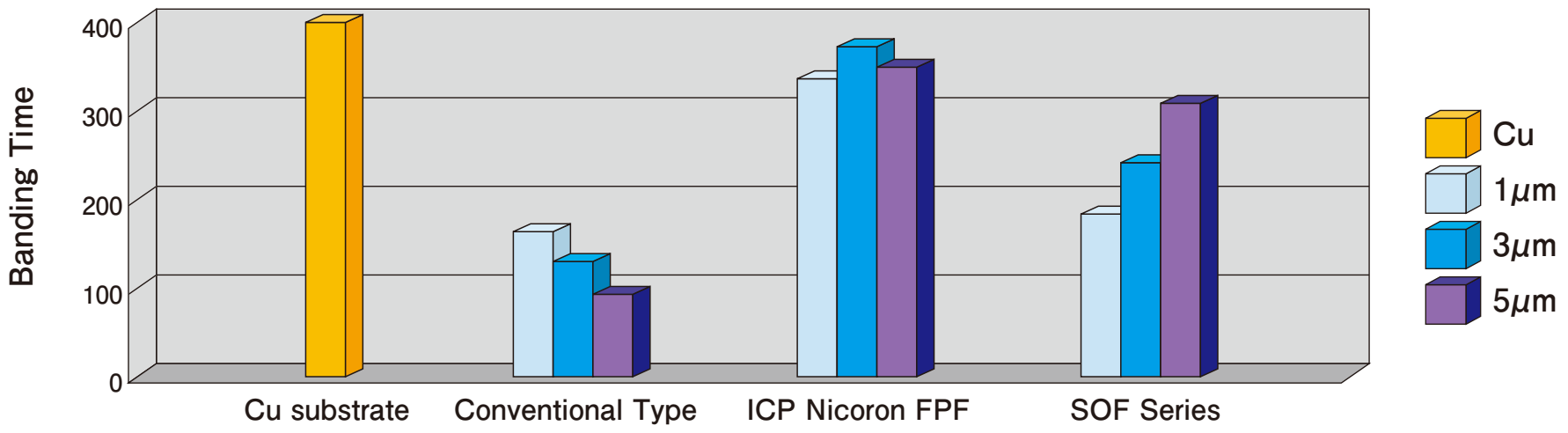
	1μm	3μm	5μm
Conventional Type (Middle P Film)			
FPF			
High P type (SOF Series)			



From this result, we observed the crack formation on the test specimen having thicker Ni plating film of the conventional type film. On the other hand, we could not observe any crack formation on the FPF and SOF films, and we found that they could gain good bending resistance.

MIT Test

We evaluated the bending resistance of ICP Nicoron FPF by applying MIT Test (evaluation by disconnection of Cu wire). From this result, we found that FPF bath gained the highest bending resistance than other bathes, and the bending resistance was same level of Cu substrate. Furthermore, ICP Nicoron FPF showed extremely high bending resistance without any dependence to film thickness.



【Film Structur】

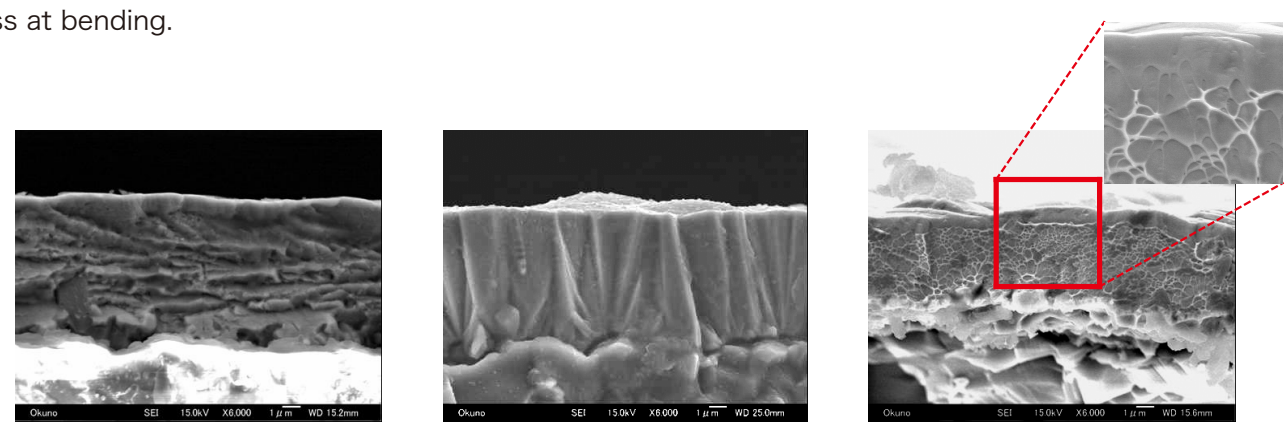
Observation of Cross Section

To investigate the mechanism of bending resistance of ICP Nicoron FPF, we observed the cross section of each plating film deposited on ceramic board.

From this result, we observed that the conventional type film showed the laminated and uneven destroyed structure, and we found that the film showed the brittle fracture. In case of such a film, we think that fracture is apt to occur from the underlying Cu by accumulation of stress at bending.

In case of ICP Nicoron SOF film, we observed many dimple shape at the fractured part. From this matter, we trust that ICP Nicoron SOF has film structure having excellent ductility and give better bending resistance compared with the conventional middle P film.

As ICP Nicoron FPF showed columnar shape comparatively uniform fractured structure, we think that it can gain good bending resistance by releasing the accumulation of stress at bending.



Conventional Type　　ICP Nicoron FPF　　ICP Nicoron SOF Series

Conclusion

We developed electroless Ni-P plating "ICP Nicoron FPF" which is suitable for FPC board. The Ni-P film from this plating bath gains extremely good bending resistance without receiving influence by the film thickness of Ni-P plating film. And also, the P content ratio is 7 wt% which is the same level of middle P type, and the deposition effect of immersion Au plating is good.

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