

Solder Free Systems by ACI and NCP

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Solder Free Adhesive Technology by ACI

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Abstract

Recently, Pb free solder technologies are developed, and start using for many packaging items. But this technology contains many problems. They are very high re-flow temperature and high cost than normal solder paste. Specially, high re-flow temperature effects heavy damage to packaging and occur many crack to packaging. We developed special ACI (anisotropic conductive ink) that becomes substitution of solder paste. This technology cans adhesive lower temperature such as 120 ~ 150 °C. Adhesion time is very short, too. This technology is suitable for mass production.

1.Introduction

Pb free solder paste is developed and used many items for SMT etc. But this paste contains problems such as re-flow crack because re-flow temperature glow up about 30 °C compare normal solder paste. This has restriction for packaging materials. We developed the adhesives ACI that can be used at low temperature. These Adhesion temperature are about 150 °C / 10 sec. And they have good connection to electronic products. This technology can use polyester base film instead of polyimide base film. And it has very good effect to price of electronic products. On the paper, we express these property, reliability and applications.

2.Struture and property and features

We show structure of ACI as Fig.1. ACI is made up of high viscosity liquid material, conductive particles and solvent. ACI has conductive in the thickness direction of that application film. But it has not conductive in x-y direction of that application film. Adhesion condition is 120 ~150 °C /10~ 30 sec./about 30kg/cm².

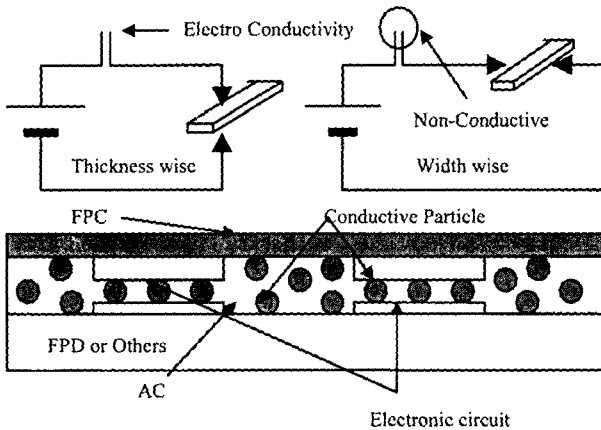


Fig.1 Adhesive structure of ACI

This ACI can adhesive lower temperature than solder paste and ACF (anisotropic conductive film). This temperature can be used not only for polyimide base film FPC but for polyester base film FPC. This is very good effect to low cost item. Minimum of line and space are 50 micron by 50 micron. ACI can printings for coating method and suitable mass production. Properties of ACI show as Table 1. And features of ACI show as Fig. 2.

Table 1. Properties of ACI

Item	Unit	ACI
Main Element	---	Binder of Rubber and Conductive Minute Particle
Solvent	---	Tetralin and others
Viscosity	Pa·s	About 35
Solid Content	%	About 38
Continuity Resistance	Ω	10 under (The Wiring Resistance is Contained)
Insulation Resistance	Ω	10 ⁷ over
Peel Strength	N	10 over (AgC-PET/ITO Glass)

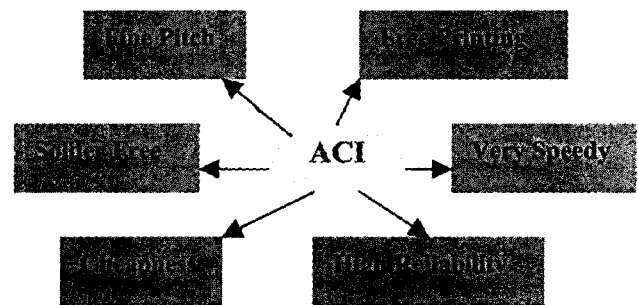


Fig. 2 Special features of ACI

3.Process for ACI

ACI can print on PCB, FPC, glass or IC. Printing machine for ACI show as Fig.3. Process shows as Fig.4. We use mesh screen mask. The mask can control the thickness of ACI with mask thickness. We can get uniform thickness. Printing and conductive system are very simple and low price. So, this process technology gives good performance to mass production.

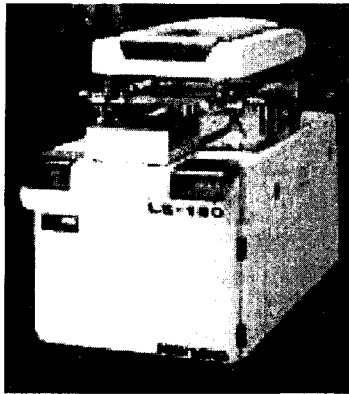


Fig.3 Printing machine for ACI

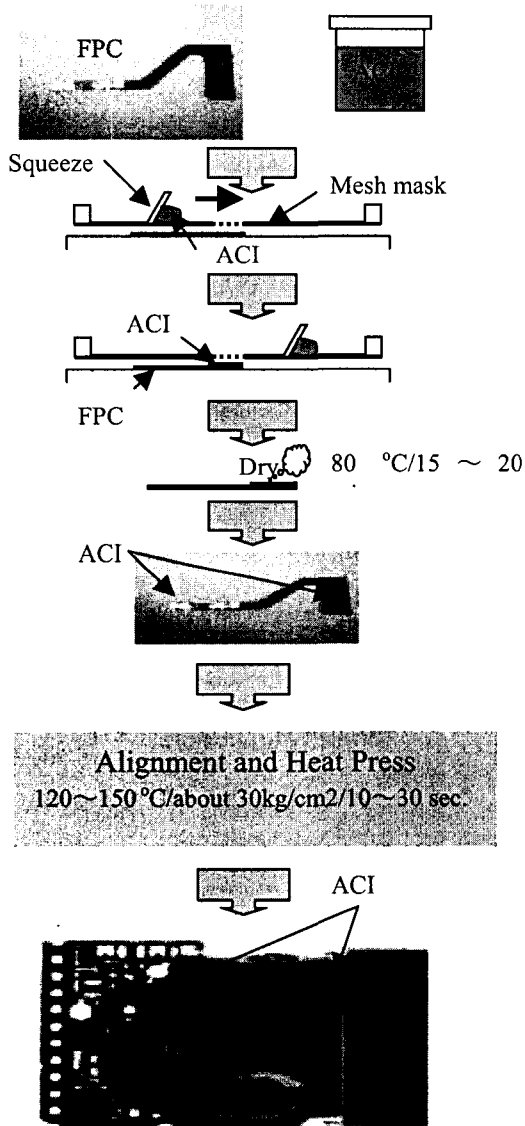


Fig. 4 Process for ACI

Fig. 5 ~ 7 shows distribution of conductive particle after 60 min. and 120 min. printing. Distribution shows good continuation printing performance.

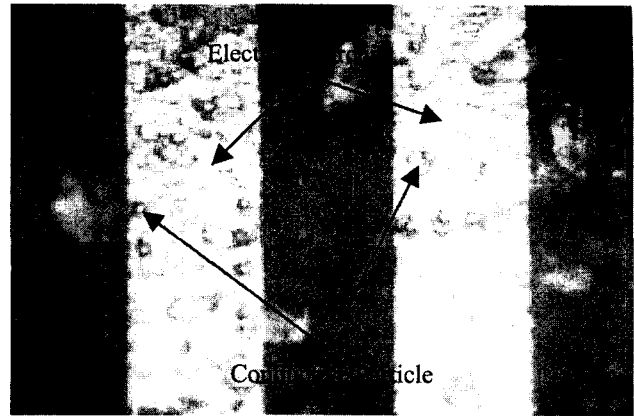


Fig. 5 Early stages of printing



Fig. 6 After 60 min. of printing

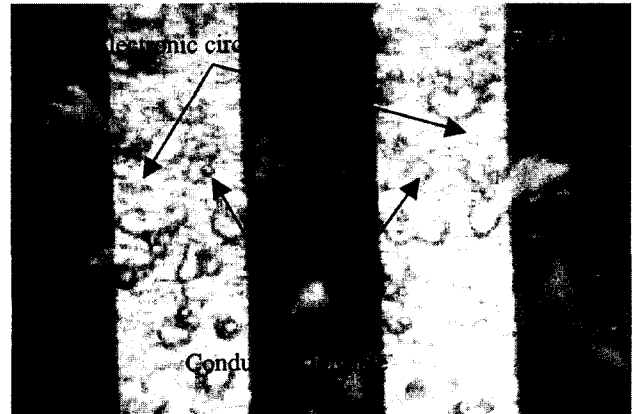


Fig. 7 After 120 min. of printing

4. Reliability of ACI

We tested about much reliability. Fig. 8 is moisture heat resistance at 60 °C / 95 % RH. We got the almost same adhesive strength as the first stage 1000 hours after. Fig. 9 shows heat resistance at 80 °C. It is property shows a little decrease compare original point. Fig. 10 shows low temperature resistance at -20 °C. It is very stable at temperature. Furthermore, migration was not generated although we did the electro-migration of silver examination by at 85 °C / 85 % RH / 1000 h with DC 90 V bias voltage.

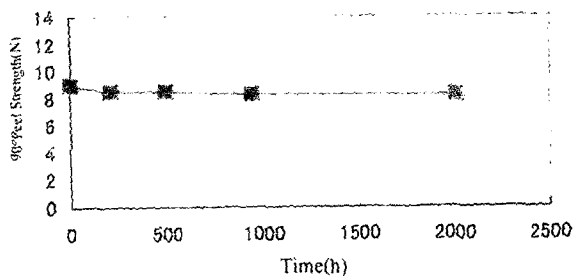


Fig. 8 Reliability of ACI at 60 °C / 95 % RH

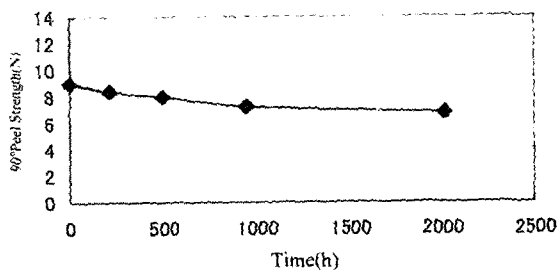


Fig. 9 Reliability of ACI at 80 °C

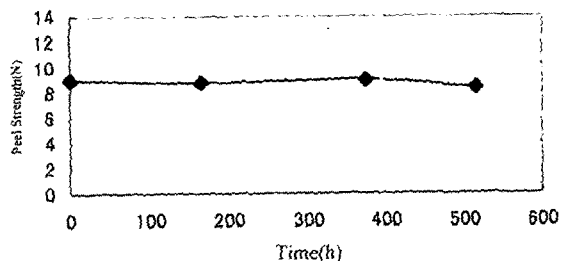


Fig. 10 Reliability of ACI at -20 °C

5. Application

ACI has good handling property and high reliability and it can consider many applications.

- (1) FPD (LCD, PDP and others)-FPC
- (2) Rigid PCB-FPC
- (3) FPC-FPC
- (4) FPC-ITO Glass
- (5) Membrane switch
- (6) Touch panel
- (7) No under fill for flip chip
- (8) Wafer level package
- (9) IC card
- (10) IC tag
- (11) In addition, the parts which need electric conductive connection

ACI can use instead of ACF. Adhesion temperature of ACF is about 180 °C. And the price is 5 ~ 10 times the price of a ACI. ACI has very good advantage than ACF.

8. Conclusions

This ACI has high reliability and good printing property. Low temperature adhesive process can use 120 ~ 150 °C / 10 ~ 30 sec. Consequently, polyester base film FPC can be used instead of polyimide base film FPC. Diversification of ACI will be needed in the near future, in response to increasing end-uses. It has good effect to no flow underfill for flip chip and wafer level packaging. Furthermore, it is suitable to low cost ubiquitous and even the field of broad band will be used.

9. References

- [1] Y. Kodera JP 3006944