Characterization of adhesive for Temporary bonding-Debonding Process in Multi-chip Packaging

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1. 서론

As many kinds of electronic device increasing in our daily life, high-performance chip processor which is possible rapid processing and high storage is needed. Typical chip production process is not enough to satisfy recent demand of consumer. Therefore new chip production process, i.e., multi-chip packaging process have been developed. Wafer is also much thinner than before [1].

Consequently, improved type of adhesive also has been necessary to cope with new chip manufacturing process for wafer handling. It needs appropriate viscosity to spin-coat, thermal resistance at least at 250 °C and enough adhesion strength is needed.

In this experiment, bisphenol A methacrylate monomer with epoxy and carboxylic functional group was incorporated to make strong bonding for forming suitable adhesion strength.

2. Experimental

Bisphenol A $(Ethoxylated)_{10}$ dimethacrylate (BPADMA, Miwon Specialty Chemical Co. Ltd., Republic of Korea) was used. Glycidyl methacrylate (GMA, Junsei chemicals, Japan) was used to introduce epoxy group. Acrylic acid (AA, Samchun chemicals, Republic of Korea) was also incorporated for carboxylic group. Trimethylolpropane triacrylate was introduced as a crosslinker. Photoinitiator was 2-hydroxy-2-methyl-1-phenyl-1-propanone (Darocur 1173, BASF, Germany). Catalyst for reaction between epoxy and carboxylic group was triethylamine. All reagents were used without any further purification. Each component blended by paste mixer (Daewha Tech, Republic of Korea). Curing condition for test was 1500 mJ/cm^2 of UV dose and 150 °C during 1 hour. Aging condition was 250 °C during 2 hours.

Adhesion strength was measured by universal test machine (UTM, Zwick, Co. German). Thermal stability was evaluated by thermogravimetric analysis (TGA 4000, PerkinElmer, USA).

3. Result and Discussion

Adhesion strength tend to increase as increasing epoxy and carboxylic group. It is because epoxy and carboxylic group reacted each other and formed strong bond which is effective to increase of adhesion strength [2]. But more than 0.5 mol epoxy group has same effect to adhesion strength. It is considered that restricted molecular mobility made reaction between each other to hard. After aging, adhesion strength decreased to 1/3 point of original adhesion strength but specimen did not separate easily. Weight loss was about 3 % in isothermal state at 250 °C, but that was not affect largely to decrease of adhesion strength. Thus it is thought that bonding between epoxy and carboxyl group has enough strength.

4. Conclusion

Epoxy and carboxylic functional group reacted each other and then made strong bond related with

adhesion strength. After aging at 250 °C during 2 hour, adhesion strength decreased to 1/3 point of original adhesion strength but it could withstand without any failure. Thermal degradation at 250 °C isothermal state was 3 % of weight loss.

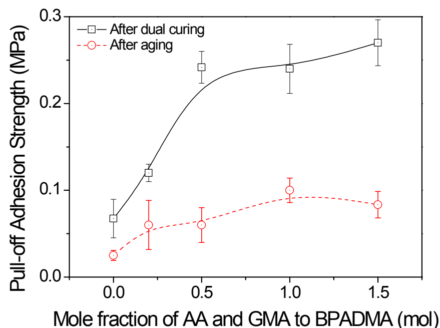

Fig. 1 Adhesion strength after dual curing and after aging at 250 oC during 2 hours as increasing epoxy and carboxylic functional group

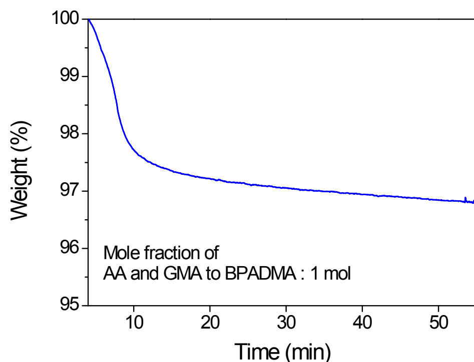

Fig. 2 Thermal degradation at 250 °C isothermal state

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