

Study Effects Staging Time and Floor Life of Epoxy Material to Reliability Performance



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Abstract

This research interested in studying about property of expired epoxy for extending life time of the epoxy in die attach process. Die attach process is one that is very important in the integrated circuit (IC) packaging manufacturing. A normal material used for attaching between die and substrate of a package which is an epoxy. From normal manufacturing process, an epoxy is stored in the frozen at - 40 °C and left at room temperature at 25 °C for 2 hours. The lifetime of epoxy is 24 hours, after that the large quantities of epoxy tubes shall be discarded. For experiment, the two types of expired conductive epoxy is used for die attach process of IC packages by changing the life time from 0, 6, 12, 18, 24, 30, 36, 42, and 48 hours. For analysis, these packages was tested by viscosity test, die shear test, and moisture sensitivity level test and was observed by scanning electron microscopy (SEM) to analyze properties of epoxy with a life time. The results revealed that possibility to extend the lifetime of epoxy from 24 hours to 30 hours.

Methodology

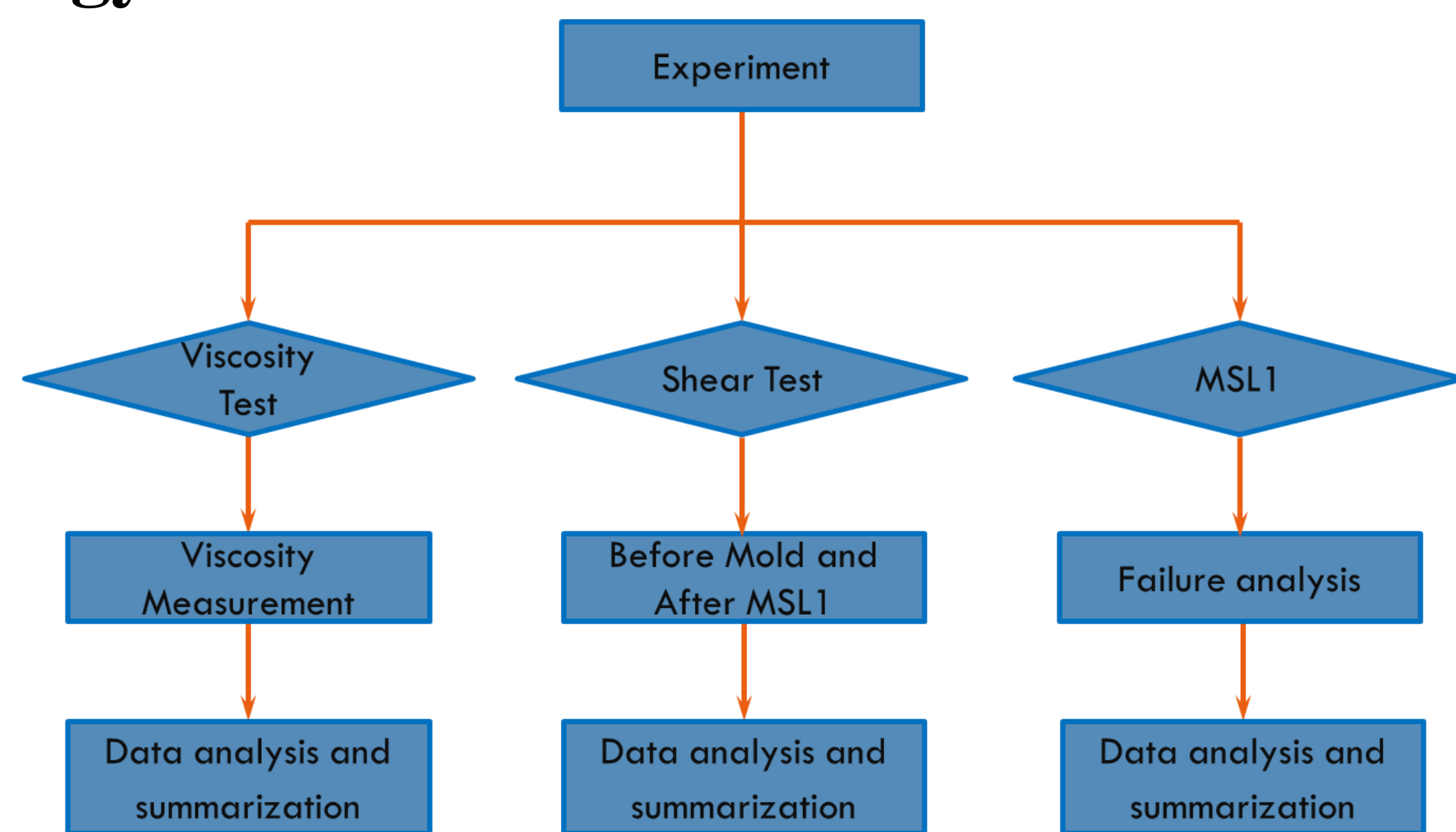


Figure 1. Schematic representation of the experimental method

- Die attach QFN package 8x8, conductive epoxy two type.
- Cross section for SEM after MSL1 process.
- Chemical decapsulation to measure the shear test between epoxy and die edge after mold process and after MSL process.

Experimental Result

Viscosity test

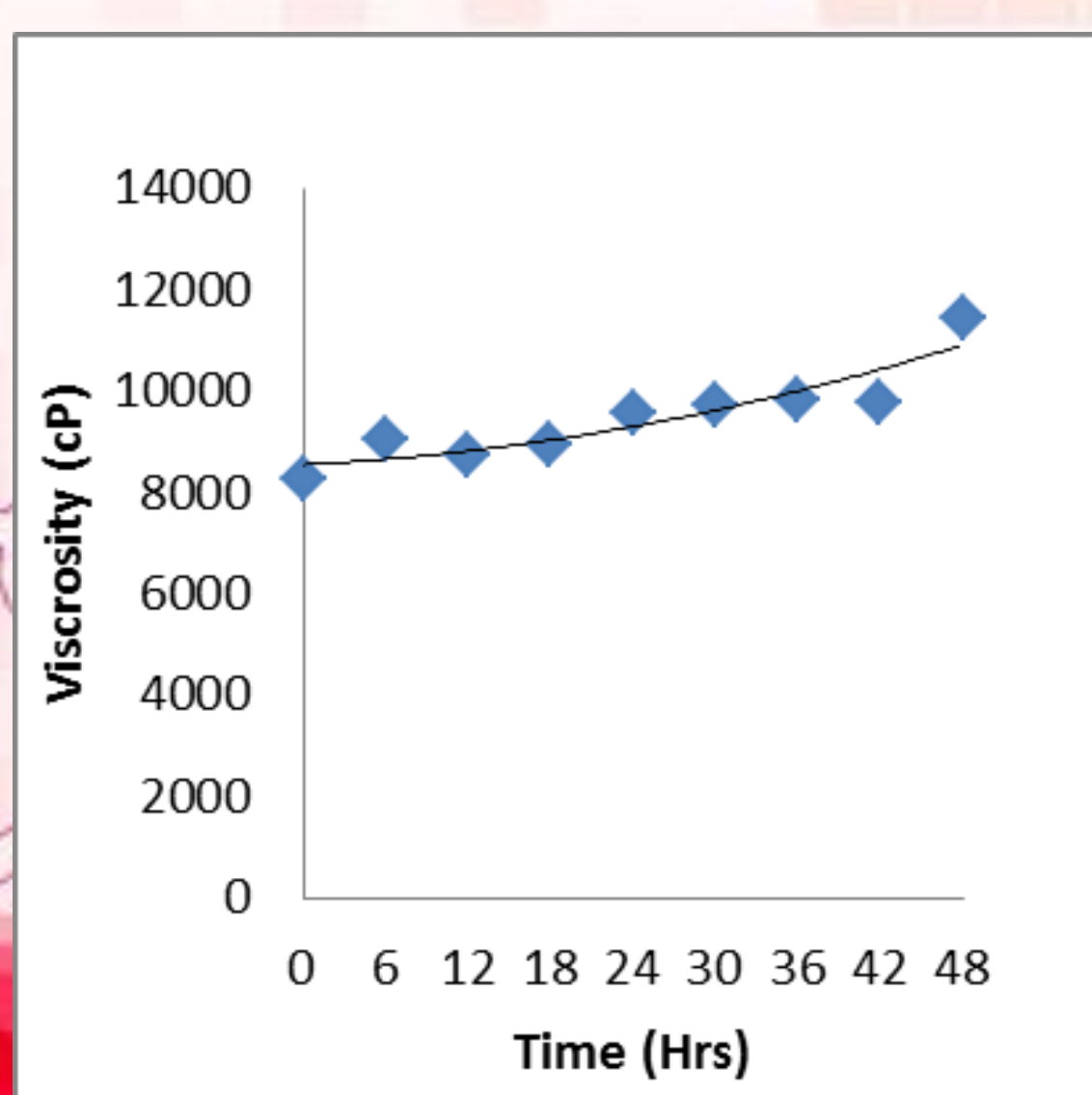


Figure 2. The viscosity test of epoxy type A.

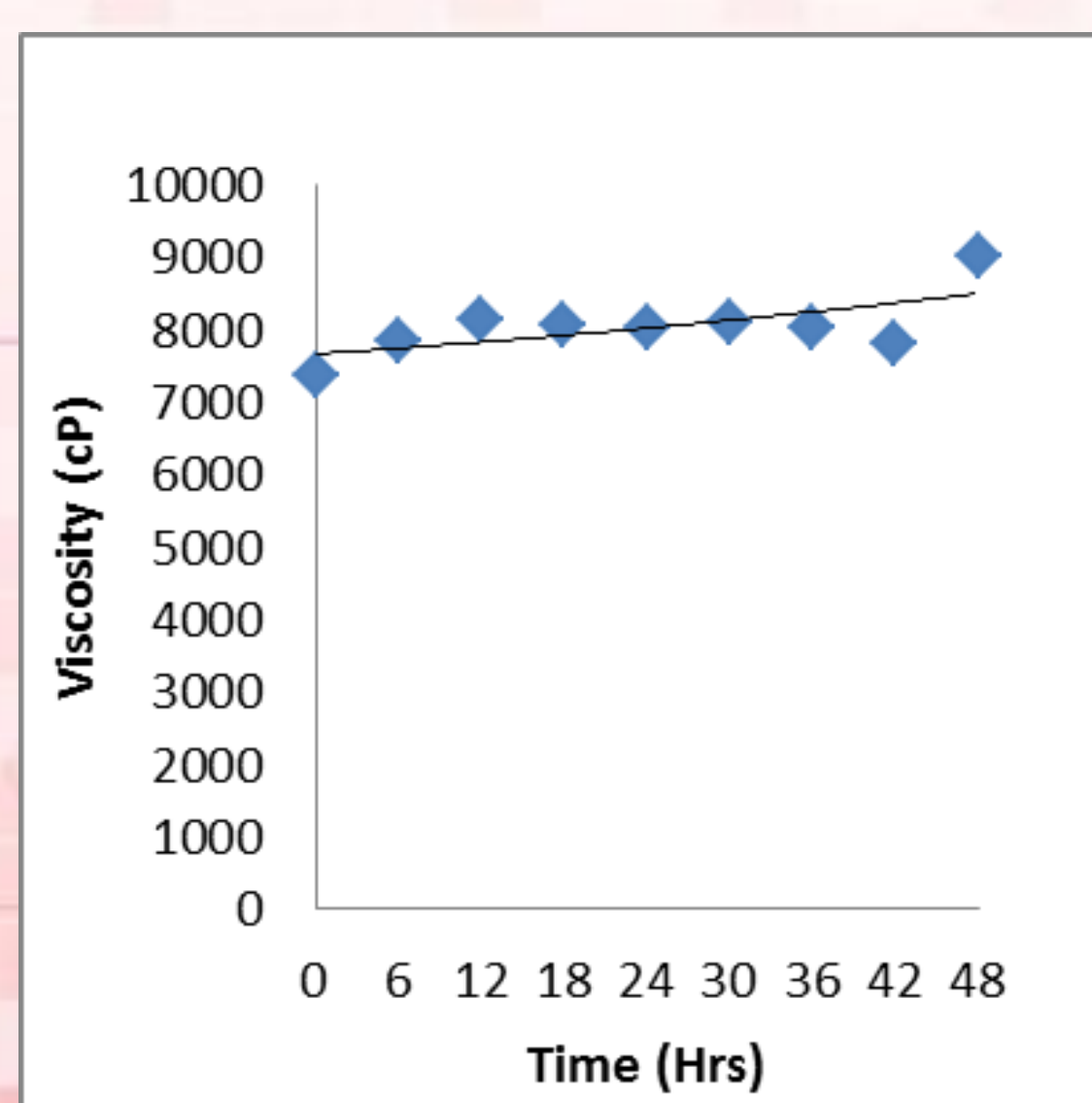


Figure 3. The viscosity test of epoxy type B.

Die shear test

Result of die shear test to before MSL process.

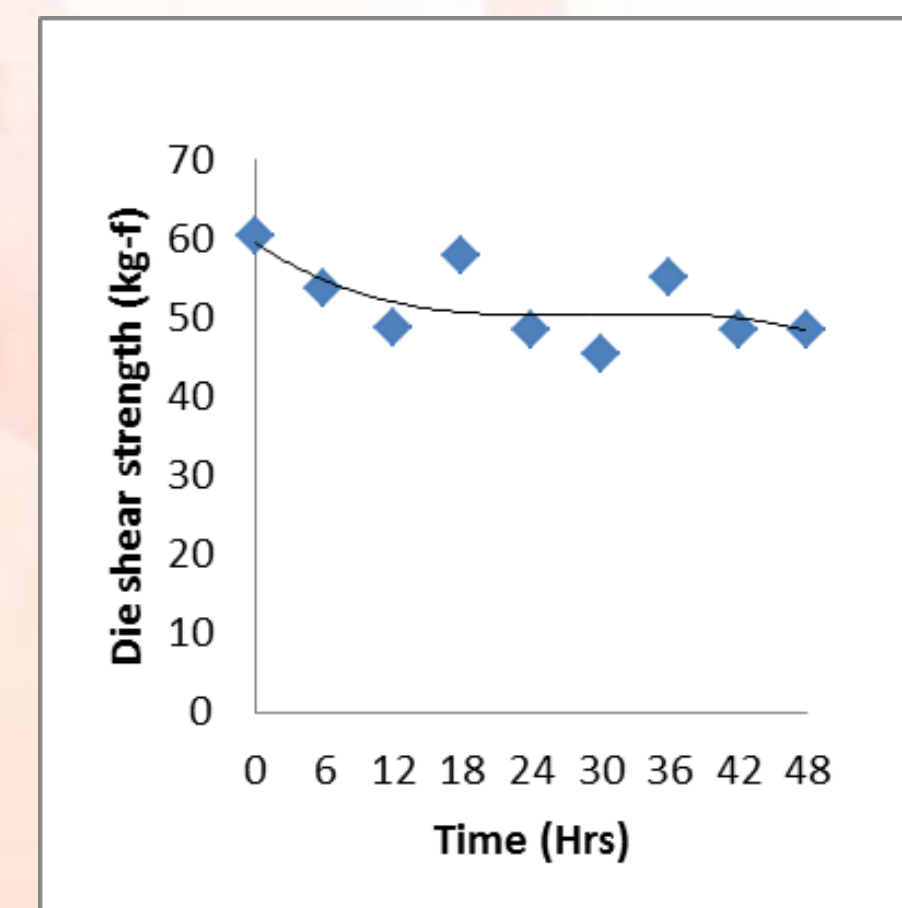


Figure 4. Show the result die shear of epoxy type A.

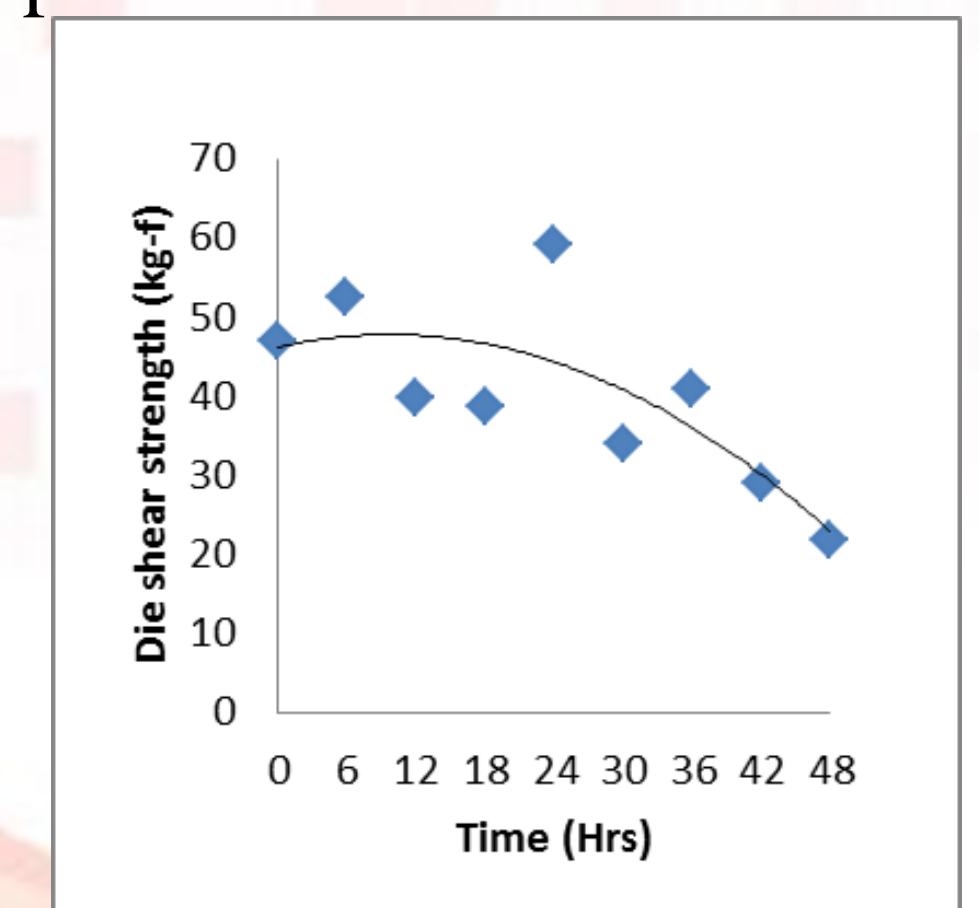


Figure 5. Show the result die shear of epoxy type B.

Result of die shear test to After MSL process.

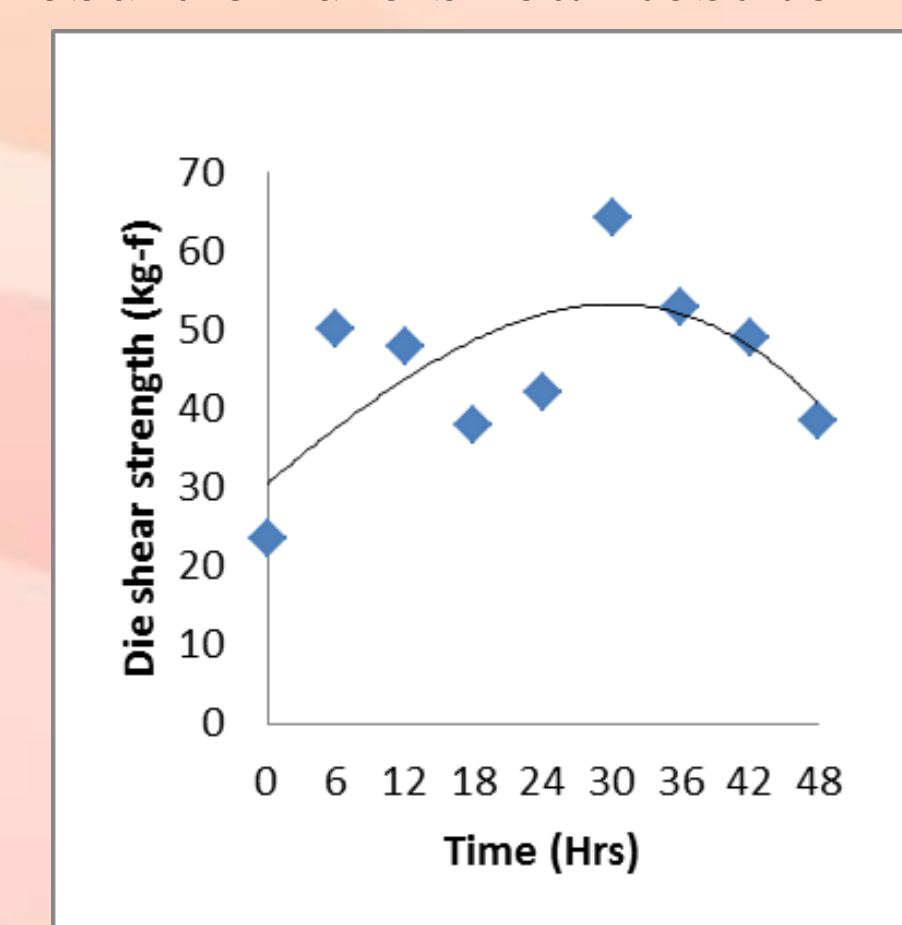


Figure 6. Show the result die shear of epoxy type A.

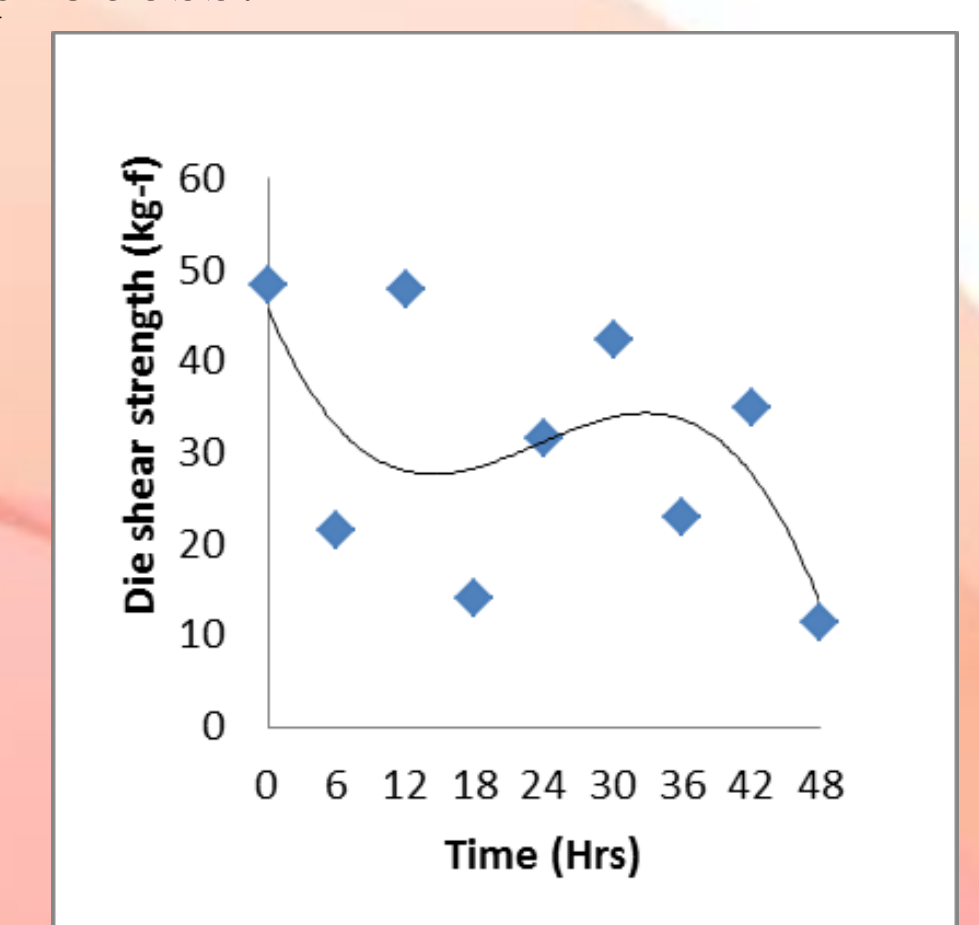


Figure 7. Show the result die shear of epoxy type B.

Moisture Sensitivity Level

Epoxy type A									
LEG#	1	2	3	4	5	6	7	8	9
Life time (Hrs.)	0	6	12	18	24	30	36	42	48
Delamination	30/22	16/22	16/22	20/22	6/22	22/22	22/22	22/22	22/22
Before									
After									
Pass or Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail

Epoxy type B									
LEG#	1	2	3	4	5	6	7	8	9
Life time (Hrs.)	0	6	12	18	24	30	36	42	48
Delamination	0/22	0/22	0/22	0/22	0/22	0/22	0/22	0/22	0/22
Before									
After									
Pass or Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail

Table 1: Show the C-Scan of epoxy type A.

Table 2: Show the C-Scan of epoxy type B.

Scanning Electron Microscope

LEG#	Life time (Hrs.)	MSL1	Full die	Left	Center	Right
1	0					
6	30					
7	36					
8	30					
9	48					

Table 3: Shown images from scanning electron microscope.

Conclusion

The results showed that the viscosity of epoxy from 0-48 hours, the viscosity increased slightly. The strength of the adhesion of epoxy by die shear test the strength of the adhesion will decrease as time increases. But the results every experiment have the value higher standard of die shear test. The moisture sensitivity level test, the results of tests at the time, 36-48 Hours were delamination the find in die area of epoxy type A. The results of all experiments to analyzed the effects from scanning electron microscope. For find out the effects that occurred with epoxy at different times. The epoxy A more than 30 hours started of delamination, but epoxy B did not found the delamination of the epoxy. When analyzing the results from the experiment all from scanning electron microscope. The results revealed that possibility to extend the lifetime of epoxy from 24 hours to 30 hours.

References

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