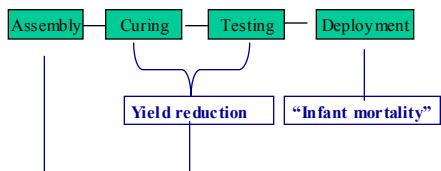


Dimensional Stability of Optoelectronic Adhesives

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¹Materials Science and Engineering, ²Electrical Engineering, and ³Mechanical Engineering

Motivation



Improper selection of adhesives is a main factor in optoelectronic module instability and misalignment loss.

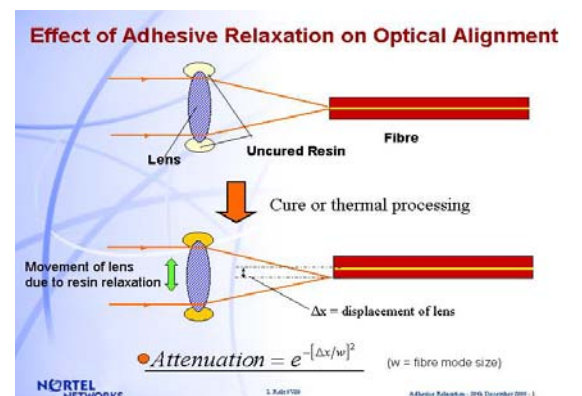
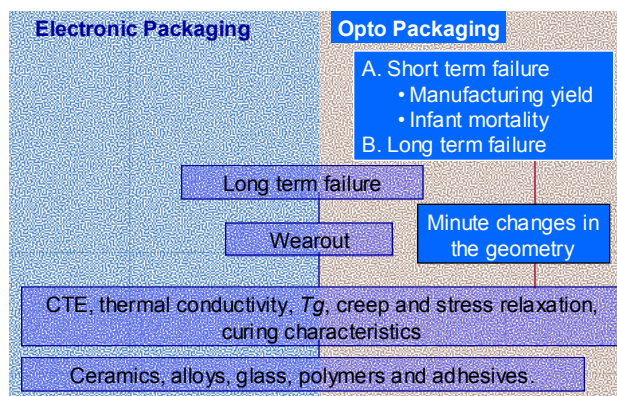
Objectives

- The project is designed to be pre-competitive.
- The major goal is to develop a knowledge and database system enabling materials selection for assembly of dimensionally stable optical and optoelectronic modules.
- Develop longer range strategy for adhesives in optoelectronic packaging.

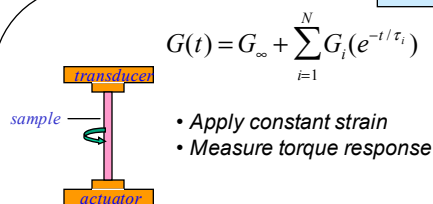
Approach

- Select appropriate adhesives (6 chosen)
- Characterize viscoelastic properties of adhesives.
- Assemble test vehicles (3 types).
- Model behavior of test vehicles.
- Verify model(s) by measuring the performance of test vehicles (optical profilometer & movement of reflected beam in "optical" test vehicle).

Background



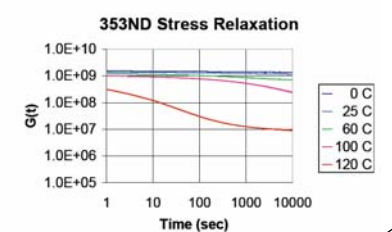
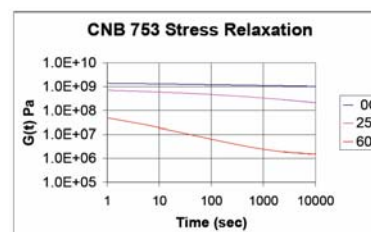
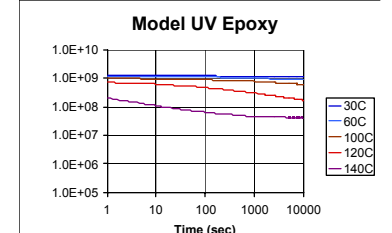
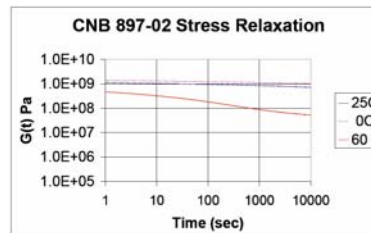
Adhesive Characterization



$$G(t) = G_{\infty} + \sum_{i=1}^N G_i (e^{-t/\tau_i})$$

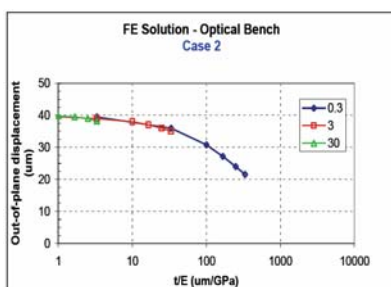
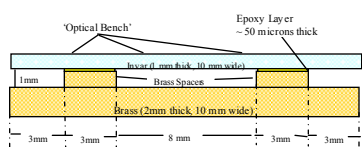
$$G(t) = G_r + (G_u - G_r) e^{-(t/\tau_p)^{1-n}}$$

- Four adhesives characterized.
- 5 types of viscoelastic tests performed.
- 2 constitutive equations developed.
- Master curves generated.
- Data used in FE models. See below.



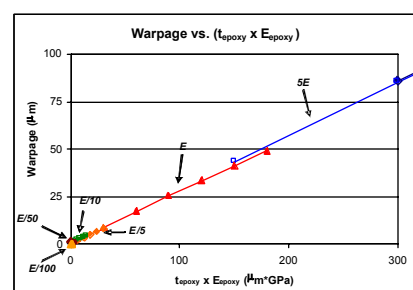
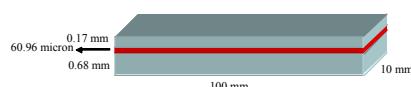
Test Vehicle Development

Phase 1

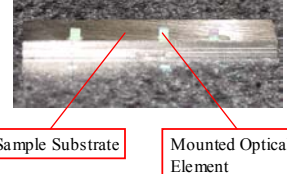
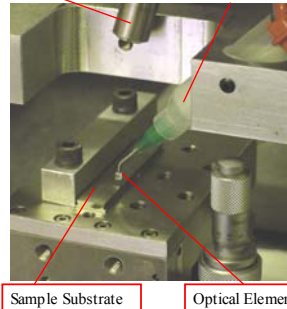
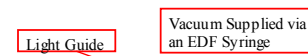


- FE models can predict warpage but changes in warpage are often minute and are difficult to measure.
- Therefore, our optical profilometer has been upgraded with a more sensitive lens and a new "optical test vehicle has been designed (see Phase 3).

Phase 2



Phase 3



Summary

- A methodology for characterizing the dimensional stability of optoelectronics adhesives has been established.
- A database is being assembled.
- A knowledge base that uses FE modeling has also taken form.
- A new test vehicle is being evaluated to verify models.

Future Work



- Optical profilometer will be used to measure dimensional changes.

Acknowledgements

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