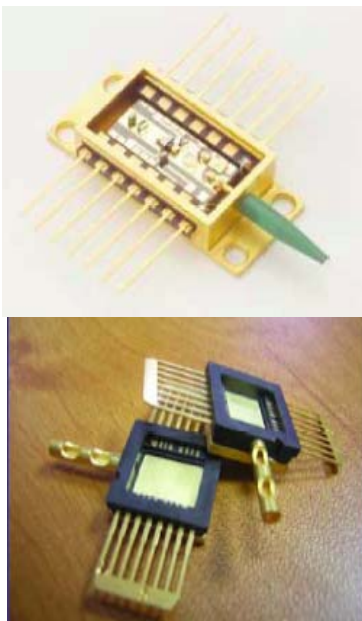


## Development of "Near Hermetic" Packages

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<sup>1</sup>Materials Science and Engineering & <sup>2</sup>Mechanical Engineering and Mechanics

### Motivation

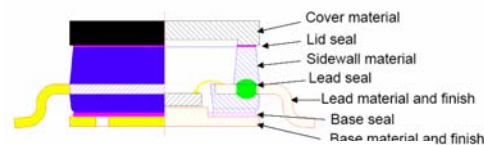


Plastic packages have the advantage of being low-cost, however, they are not hermetic. LCPs can be formulated to have excellent barrier properties. See background.

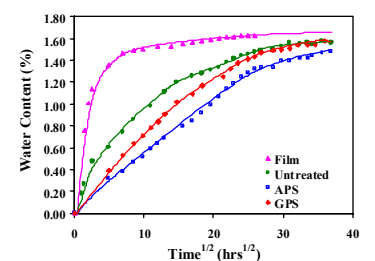
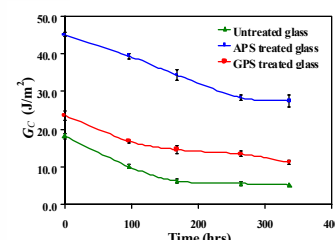
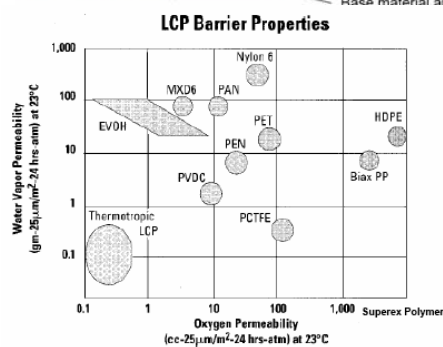
### Objective

The purpose of the project is to evaluate the performance of "state of the art" plastic packages for optoelectronics applications and to elucidate the role of interfaces in the ingress of moisture into these packages.

### Background



Hydrolytic stability of epoxy/glass interfaces were evaluated as a function of exposure time at 85 C and 85 % RH.

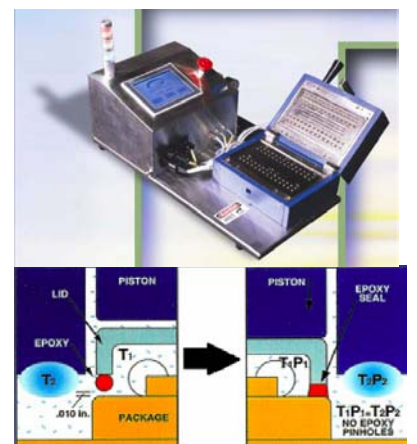


Orasa Khayankarn (Ph.D. Lehigh 2004) found that the strength of the interface correlated well with interfacial diffusion.

### Approach

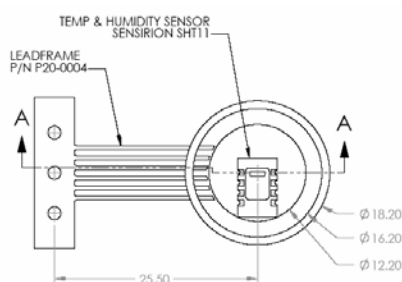


- LCP housing is injection molded.
- Lid is sealed using a variety of epoxies and surface treatments.
- Moisture ingress of packages is measured directly using embedded temperature/humidity chips.
- The strength of epoxy-LCP interfaces measured using DCB test as a function of humidity exposure at 85 C and 85% RH.
- Moisture ingress also measured by gravimetric means.

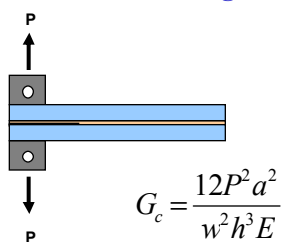


### Work in Progress

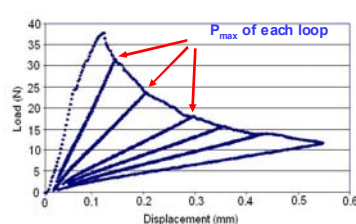
#### Humidity Sensing



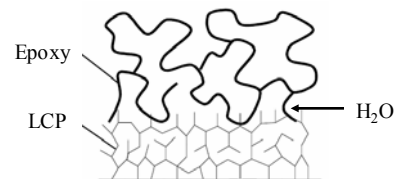
#### Adhesive Bond Strength



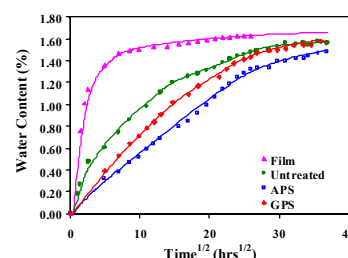
#### Typical DCB Analysis



#### Interfacial Diffusion



#### Expected Moisture Results



### Summary

- Adherends made from LCP have been injection molded.
- Preliminary DCB tests with a proprietary adhesive/sealant from RJR Polymers have been performed
- Model epoxy adhesives will be studied.
- Moisture absorption studies on LCP and LCP-epoxy-LCP sandwich structures will be performed.
- A new interfacial diffusion test vehicle has been designed and will be constructed.
- Evaluation of packages made by RJR Polymers is in progress. Fine leak measurements have been performed using the NORCOM leak detection system.

### Acknowledgements

Supported by funds from PA. Technical discussions with Dick Ross and John Romai of RJR Polymers were extremely helpful. See [www.rjrpolymers.com](http://www.rjrpolymers.com)