

## Technology Status – Passive Performance

- **Waveguide-to-fiber coupling loss** 0.05dB/facet
  - **Waveguide propagation loss** <0.07dB/cm
  - **Planarizing gap fill** Single step; No reflow
  - **Mux & tap coupling efficiency** 92~96% mux
  - **Mode size conversion demonstrated** ~3:1 reduction
- **Note; the dielectric test data by STMicro was the basis for high k capacitor applications of rare earth doped amorphous coatings by the bias PDC process.**
- **Damp heat testing of the optical waveguide amplifier with the same dense refractory oxides , showing geological resistance to moisture, was the basis for the development of the widely allowed dielectric barrier film patents and applications.**

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# Barrier Applications

**Deposition of  
High-Quality Glass-Ceramic Films**

**Optical**

- Semiconductor High-k Dielectric
- Backplane Integrated Passives
- Optical Mode Management
- High-Index Passive
- Er-doped Active

**Physical**

- EO Barrier
- OLED encapsulation and Barrier
- Plastic substrate Barrier

Dense  
Uniform  
Conformal  
Defect-Free  
Multi Layer  
Large Area  
Low Temperature  
Low Contamination  
Wide Compositional Range

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## Barrier Coating Applications

### Encapsulating Moisture & Oxygen Barrier for:

- Organic Light Emitting Diode (OLED) Displays
- Inorganic Electro-Luminescent (EL) Displays
- Photovoltaic (PV) Cells
- Optical storage media

### Wear-Resistant Dielectric Barrier Coating for:

- Touch (Fingerprint) Sensors
- Displays / touch sensitive and pen based display and electronics
- Other Bio-contact sensors
- Optical polymers and devices, eyeglasses, optics

### Contamination & Thermal Barrier for:

- OLED Displays and electronics on glass and Plastic Substrates
- Flexible Electronics on Plastic Substrates

### Protective Anti-Reflective Optical Coating for:

- Display glass – out coupling for OLEDs
- Polymer sheet substrate stock
- CD-DVD-R disks
- VCSELs and III/IV devices and modules
- SAW devices

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## Earliest moisture barrier feasibility - Process and Test Conditions

- **Substrate: glass or silicon wafer**
- **Aluminum: 100Å sputtered aluminum (porous)**
  - Blanket or
  - Shadow mask patterned
- **Barrier: 1000Å or 2000Å "35-65" aluminosilicate**
  - 35% silica & 65% alumina
  - Two process recipes "A" and "B"
- **Process Temperature: at ambient**
- **Test Conditions**
  - Symmorphix 85°C /~95% RH
  - Philips 85°C /50% RH
  - Battelle 60°C /90% RH
- **Testing in both boiling water and in a pressure cooker (suggested by Dr. Kam Law, CEO of AKT) showed the latter to be much more effective in corrosion developments of barrier defects.**

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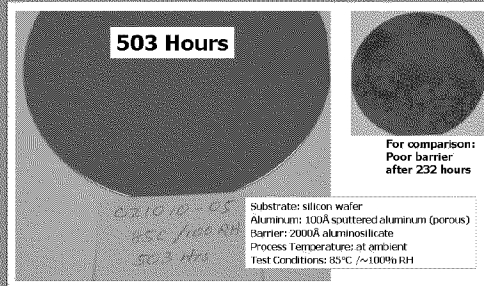
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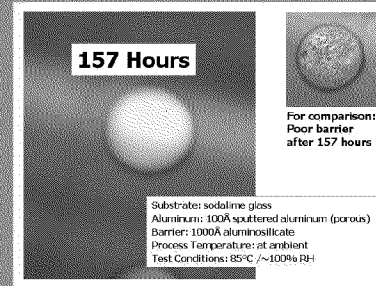


## Initial Barrier Performance on Aluminum coated wafers and glass with 100nm 92/8

- Barrier tests conducted on Al coated Si wafers covered with 10 nm Alumino-Silicate show no degradation of Al after 500 hrs. under 85/95 condition, Q3 2002



Whole coated wafer



Al dots coated wafer

- Pre Symmorphix/USDC program
- Work began August 2003 with polymern and OLED manufacturers
- Key challenge: Process integration

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