ULTEM™ & EXTEM™ RESINS

CHEMISTRY THAT MATTERS™

COFFEE LECTURES HS21 / OSTSCHWEIZER FACHHOCHSCHULE

Florian Jung
October 20th 2021
LENORPLASTICS UND SABIC STELLEN SICH VOR

1976
Company established

32,000
Employees around the world

50
Countries of operations

3rd
Largest global chemical company*

212th
Largest public company in the world*

82.6
US$ bn
Total assets

1.5
US$ bn
Net income

37.3
US$ bn
Annual revenue

≈ 150
New products each year

9,946
Global patent filings

High Performance Polymers

*As of 2023

Lenor
plastics ag
...more than plastics!
INFRASTRUCTURE: EXPLOSION OF DATA AND TRAFFIC DEMAND

New Paradigm: On-Board Optics
• ~48-64+ connections per rack unit
• Faster speeds
• Lower power consumption
• Improved capacity to cool optical engine

Old Paradigm: Pluggable Transceivers
• Max ~32-36 connections per rack unit
• Higher speeds increase power consumption
• Cooling challenging for high speed (gigabit) units
• Each connection has same equipment on each end
ADVANTAGE OF THERMOPLASTIC COMPONENTS

DESIGN FREEDOM
Thermoplastics can allow complex part designs that are potentially limited in alternative solutions like glass or thermoset resins

INTEGRATION AND SIMPLIFICATION
Thermoplastics allow the integration of mechanical (such as fixtures) and optical features to simplify design and assembly for potential cost improvement

ECONOMY OF SCALE
Injection molding of thermoplastics enables high precision manufacturing of complex parts at large build numbers
ON-BOARD OPTICS (OBO) & CO-PACKAGED OPTICS (CPO)

**Requirements beyond pluggables**
- Extreme dimension stability
- JEDEC reflow solderability @ 260°C
- Proven processes for assembly incl. alignment with fiber and placement of lens on PCB

**Trends**
- Increased design freedom for function integration
- Redundancies within a PCB considered to reduce risk of failure
- Hesitation to make step change to OBO/ CPO

**Challenges**
- Smaller fiber core size (SMO) needs higher dimensional stability of lens
- No defined ecosystem with standards and regulations in
- Increased complexity of maintenance

Application:
- Pluggable transceivers
- Onboard optics (OBO)
- Co-packaged Optics (CPO)

Material properties:
- MICRO MOLDING
- AR COATINGS
- DIMENSIONAL STABILITY
- HEAT RESISTANCE
- REFLOW SOLDERABILITY
- HIGH REFRACTIVE INDEX
EXAMPLE OF ON BOARD OPTICAL TRANSCEIVER

EXTEM multi-mode on board optics/CPO*

Connector designed using EXTEM RH1016 UCL resin series optical properties
- 4 Rx and 4 Tx lens array on bottom with 250 µm spacing
- Internal reflective mirror to front lenses
- Front MT ferrule connection
- 4.3 x 8.9 x 2.1 mm (W x L x H)


- 50 lenses measured after reflow
  - Max. dimensional change +/− 0.25%
  - All 50 samples within tolerance of 0.5%
  - Max. signal loss of 0.4db
EXTEM™ VH resins
- Improved Metalizable Capabilities
- Cost/performance balance

EXTEM™ XH resins
- High temperature creep
- Lead-free soldering capabilities
- ER009090: improved IR transmission and molding conditions

EXTEM RH 1016 UCL resin
- Improved dimensional stability through lead-free solder process

Reflow soldering peak temp shall be min 15°C below TG

Experimental
TG = 277 °C

VH Series
TG = 247 °C
VH1003

XH Series
TG = 267 °C
XH1015
XH1015UCL

RH1016UCL

Temperature (°C)
0 50 100 150 200 250 300
0 100 200 300 400 500
Time (sec)

260°C peak temp. (10 sec at 255-260°C)
0.8°C/sec
1°C/sec
# EXAMPLE OF RF ISOLATOR BEING SPECIFIED IN SWITZERLAND

<table>
<thead>
<tr>
<th>Application:</th>
<th>Isolator for RF</th>
</tr>
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<tbody>
<tr>
<td>Grade:</td>
<td>ULTEM™ 1010R</td>
</tr>
<tr>
<td>CTQ’s:</td>
<td>- Low CTE</td>
</tr>
<tr>
<td></td>
<td>- Low warpage</td>
</tr>
<tr>
<td></td>
<td>- High stiffness and mechanical strength</td>
</tr>
<tr>
<td></td>
<td>- Low moisture uptake</td>
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<tr>
<td>Contact:</td>
<td>Björn Wigger, Lenorplastics AG</td>
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<tr>
<td>Value Prop:</td>
<td>- UL94 V0 and RTI listing</td>
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<tr>
<td></td>
<td>- Availability and contact to the customer</td>
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<tr>
<td>Comp:</td>
<td>- PPSU and PES</td>
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THANK YOU
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APPENDIX
ADDITIONAL TECHNICAL INFORMATION
SABIC OFFERS THERMO-OPTICAL PORTFOLIO FOR SOLDERING APPLICATIONS

SABIC offers a wide range of solutions for applications that use soldering for mounting of parts and modules onto PCB’s. Crystal clear LEXAN™ CXT resins for low temperature soldering, and IR transparent ULTEM™ and EXTEM™ resins for more demanding solder processes, including reflow soldering.
Zemax Optical Studio parameters are available for modeling design, including:

- $dn/dT$
- Stress optical coefficient
- Internal transmission, different thickness, standard plaques for external validation
CONTACT
YOUR CONTACT IN SWITZERLAND

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Lenor plastics
... more than plastics!
YOUR PRESENTER
FLORIAN JUNG - SENIOR GLOBAL BUSINESS MANAGER

Florian is the Global Business Line Manager for EXTEM™ and ULTEM™ Copolymer Product groups. He looks back at 20+ years of experience in the plastics industry. Since joining the organization in 2013, Florian has held different positions in Sales and Marketing leading European and Global teams before accepting current role in September 2018. Worked across multiple functional disciplines in Sales, Marketing and Product Management covering different markets and business units. He is based in Germany and holds a degree in Plastics Processing from the School of Applied Science in Siegburg as well as a degree in Economics from the VWA in Koblenz.

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