MATERIALES ESTRUCTURALES PARA IN MOLD ELECTRONICS

Jordi de Tera – SABIC SPECIALTIES

Junio 2020
INTRODUCING OUR PARENT COMPANY

SABIC AT A GLANCE
SABIC AT-A-GLANCE

1976
Company established

33,000
Employees around the world

50
Countries of operations

3rd
Largest global chemical company*

122nd
Largest public company in the world*

85
US$ bn
Total assets

5.7
US$ bn
Net income

45
US$ bn
Annual revenue

≈ 150
New products each year

11,738
Global patent filings

64
World-class plants worldwide

3.96
US$ bn
Estimated Brand Value**

*Forbes 2018  **Brand Finance, 2019
BUSINESS PORTFOLIO

PETROCHEMICALS
- Polyolefins
- Polycarbonates and Blends
- PVC, Polyester and Polystyrene
- Functional Forms
- Synthetic Rubbers
- Specialty Polymers & Polymer Additives
- Fluids
- Glycols, Olefins, Oxygenates and Aromatics
- Chemical Intermediates & Industrial Gases

SPECIALTIES
- Specialty Engineered Thermoplastics
- Specialty Compounds
- Advanced Composites
- Additive Manufacturing
- Thermosets and Additives

AGRI-NUTRIENTS
- Nitrogen
  - Prilled Urea
  - Granular Urea
  - Ammonia
- Phosphate
  - DAP and Dark DAP
  - MAP
- Specialty
  - NPK
  - TGU

METALS*
- Long Steel
- Rebar
- Wire Rod
- Rebar in Coil
- Flat Steel
  - Hot Rolled Coils
  - Cold Rolled Coils
  - Galvanized Rolled Coils
  - Pre-painted Rolled Coils

* Supplied under SABIC brand through Hadeed, a fully-owned SABIC Affiliate
MATERIALES ESTRUCTURALES PARA IN MOLD ELECTRONICS
IN-MOLD ELECTRONICS: WHAT IS IT?

IN-MOLD ELECTRONICS (IME) = IN-MOLD DECORATION (IMD) + PRINTED ELECTRONICS

INTEGRATED COMPONENTS:

- Conductors
- Antennas
- LEDs
- IC components

- Transparent conductors
- Sensors
- Haptics-under development

Instrument cluster with capacitive switches

Door panels: special effects and with touch switches and LEDs integrated

Extended curved display on dashboard

Curved center console display controls

Backseat display

NFC

TactoTek LightStripe™

Proximity sensing cover

Recessed capacitive buttons

Hidden-until-lit icons

Printed graphics & effects

Recessed capacitive slider

Sales Account Manager
Sr. Jordi de Tera
SABIC SPECIALTIES
IME: VALUE PROPOSITION

TODAY

Design
- Enables styling: 3D electronics & packaging optimization
- Enables haptic, communications, touch, sensors

Engineering
- Weight saving up to 70%
- Thickness reduction, up to 90%
- Assembly simplification and electronics protection
- Cost: One injection tool vs many

Tomorrow

Several discrete components

One integrated part

IM E

Courtesy of Tactotek™
IME: SABIC’S SOLUTIONS

FILM A
Coated LEXAN™ PC film HP92T, HP60T, HP40T, HP12T

OVERMOLDING RESINS
LEXAN™ Resin
LEXAN™ HFD Resins
LEXAN™ CXT Resins
ULTEM™ Resins
PC copolymer
PC copolymer
PEI

FILM B
Uncoated formable PC film: examples LEXAN™ 8010, LEXAN™ 8A13E
Uncoated high heat formable
ULTEM™ 1000
Requirements for the structural material:
- High flow
- Dimensional stability
- Transparency
- Good mechanicals
- Protect the inks and the electronics
**SABIC OVERMOLD RESINS FOR IME**

### SABIC Solutions for IME

<table>
<thead>
<tr>
<th>For small parts</th>
<th>For medium / big parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>LEXAN™ Resins</td>
</tr>
<tr>
<td>PC Copolymer</td>
<td>LEXAN™ HFD Resins</td>
</tr>
<tr>
<td>PC Copolymer</td>
<td>LEXAN™ EXL Resins</td>
</tr>
<tr>
<td>PC Copolymer</td>
<td>LEXAN™ CFR Resins</td>
</tr>
<tr>
<td>PC Copolymer</td>
<td>LEXAN™ CXT Resins</td>
</tr>
<tr>
<td>PEI</td>
<td>ULTEM™ Resins</td>
</tr>
<tr>
<td>LEXAN™ HF – Standard high flow polycarbonate from SABIC PETCHEM</td>
<td></td>
</tr>
<tr>
<td>LEXAN™ HFD1830 &amp; LEXAN™ HFD1930 (extreme high flow ductile /low temp processing)</td>
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<tr>
<td>LEXAN™ EXL1810T (high flow, impact low temperature)</td>
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<tr>
<td>LEXAN™ CFR9712 (high flow, flame retardant)</td>
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<tr>
<td>LEXAN™ CXT17, CXT17UV, CXT19 and CXT19UV (high heat and UV resistant)</td>
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</tr>
<tr>
<td>ULTEM™ 1010 (high heat solution, flame retardant)</td>
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</tbody>
</table>

Note: Other resin grades can be evaluated depending on application requirements
SABIC OVERMOLD RESINS FOR IME

Flow at different part thickness

Flow Length at 1mm thickness

Flow Length at 2mm thickness

Higher Flow grades are LEXAN™ HFD resins.
LEXAN HFD RESINS
LEXAN™ HFD – SUPERIOR FLOW AND DUCTILITY

Flow & process ability ➔

Lexan HFD
Lo MW resin

Standard PC Lo MW

Lexan HFD
Hi MW resin

Standard PC Hi MW

Chain length/Mechanical properties ➔
LEXAN™ HFD RESINS – SUPERIOR FLOW

LEXAN HFD resin has up to 40% more flow compared to similar PC resin.
LEXAN™ HFD RESIN FOR OVERMOLDING

Enables lower temperature and pressure during overmolding, critical factors to protect the inks

Low Temp Processing PC resin
LEXAN™ HFD
LEXAN™ HFD – LOW TEMPERATURE PROCESSING

What?
~20°C (40°F) lower processing temperatures for same mechanical properties

Where?
- Parts using temperature sensitive additives
- In Mold Decoration and In Mold Electronics
- Over molding with a second resin

LEXAN HFD resins can be used for touch panels and head up displays
LEXAN™ HFD – BIO & GREEN CONTENT

What?
• <10% bio/green content
• Bio-based, Post consumer recycle combinations possible

Where?
• Consumer electronics
• EPEAT and other environmental considerations
LEXAN™ HFD RESINS – SUMMARY

LEXAN™ HFD is a polycarbonate based copolymer with:

- Improved toughness/ductility vs standard PC with same melt flow index
- Improved melt flow vs standard PC at same toughness/ductility
- ~20°C lower processing temperatures and pressure vs standard PC to protect the conductive and decorative inks
LEXAN™ HFD RESIN – PORTFOLIO

For more information to other grades in HFD portfolio, please contact relevant LEXAN® Copolymer business manager in your region.
THANK YOU
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